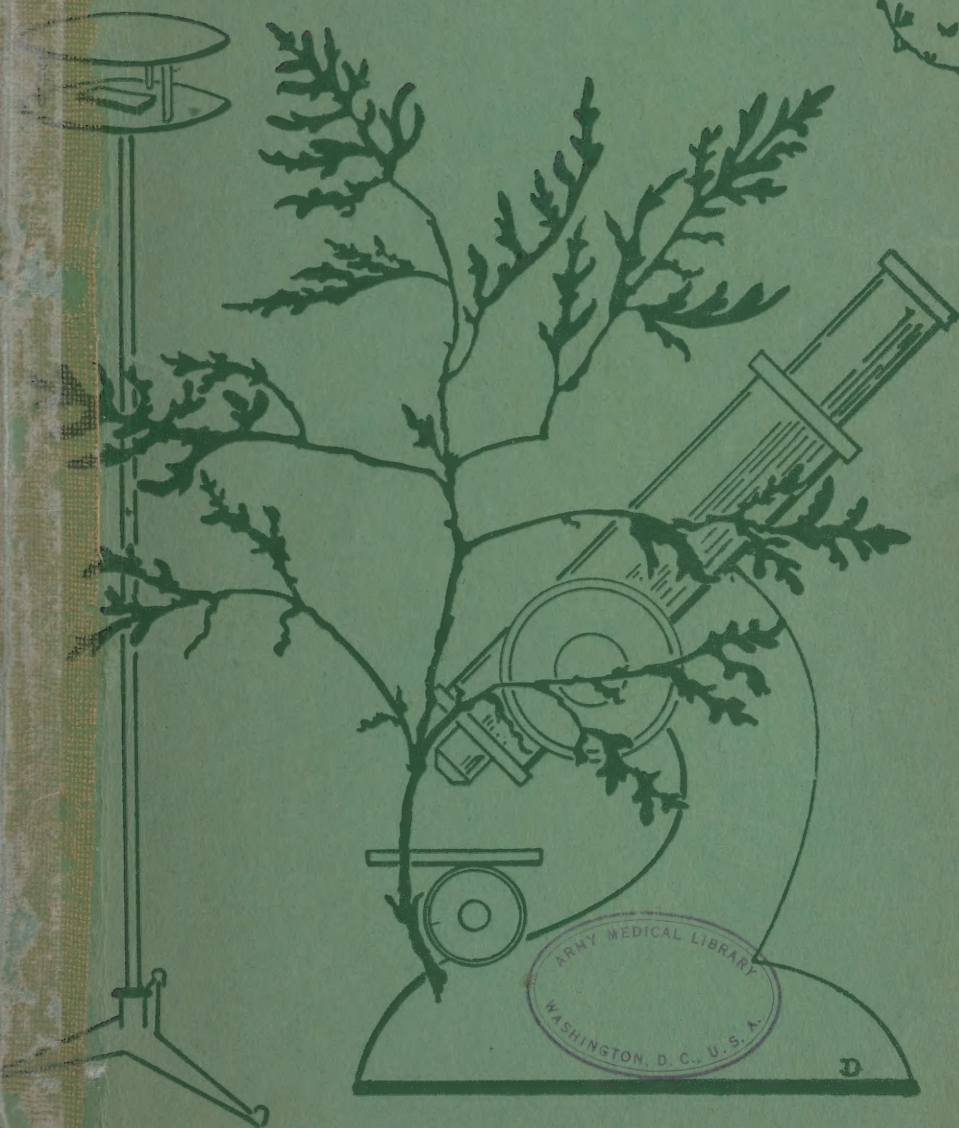
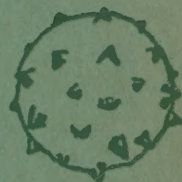


# HAYFEVER STUDIES

in

## NEW HAMPSHIRE

### 1947



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STATE OF NEW HAMPSHIRE  
**HAYFEVER STUDIES**  
IN  
**NEW HAMPSHIRE**  
**1947**

by  
Frederick J. Vintinner  
and  
George W. Morrill, Jr.

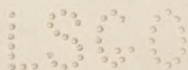


**State Department of Health**  
John Samuel Wheeler, M. D.  
State Health Officer

**Division of Industrial Hygiene**  
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**Concord, New Hampshire**

**1948**



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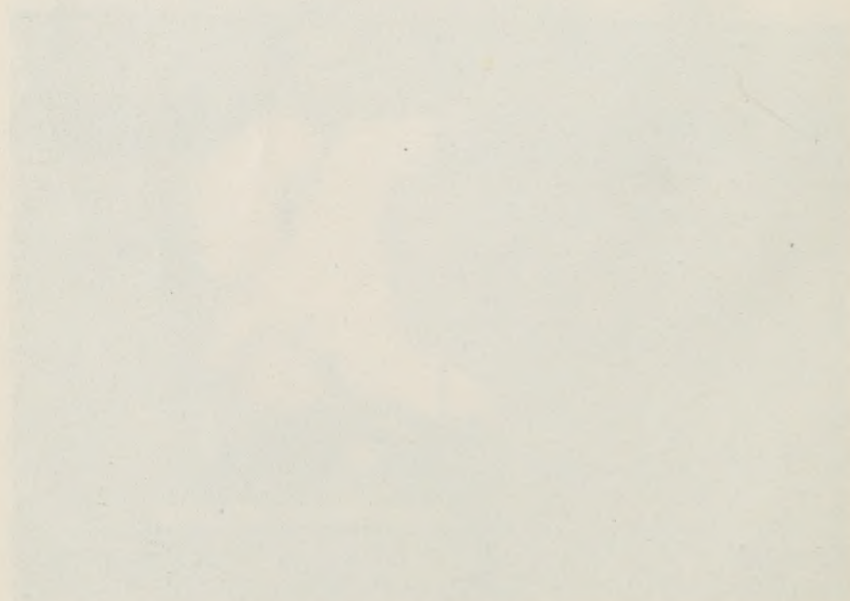
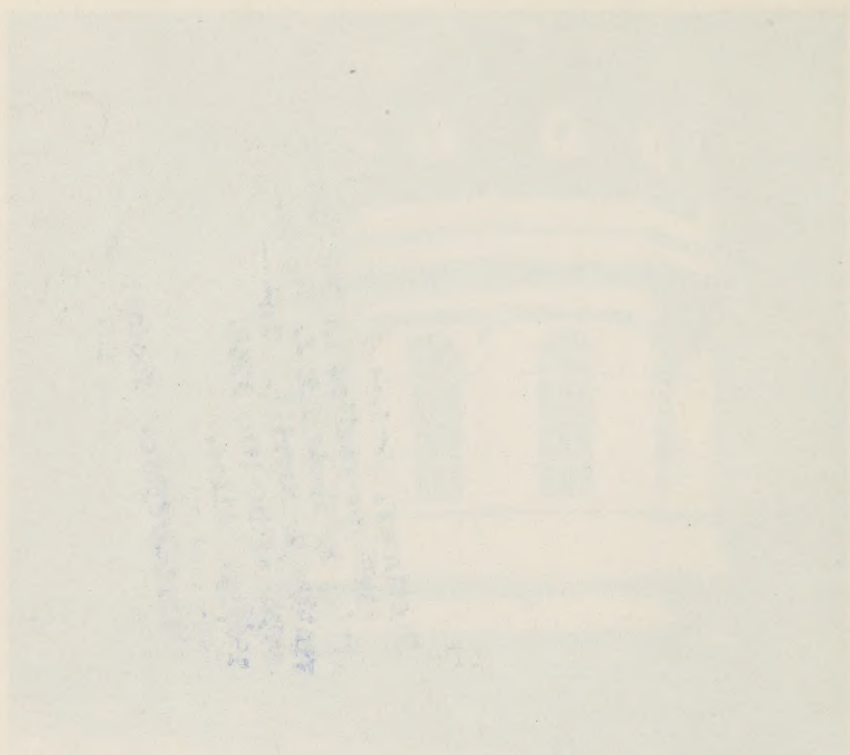
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"Measuring the Amount of Hayfever Pollen in the Air"

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## INTRODUCTION

### Hayfever

Hayfever (pollinosis) consists essentially in hypersensitivity to the airborne pollens of weeds, grasses, shrubs and trees. The terms "hayfever" and "hay asthma" are misleading, since the manifestations are elicited not by hay itself, but by the pollens of various plants. The expression is further misleading since it is rarely that a patient has an actual fever, although it is not uncommon for the patient to complain of the sensation of feverishness. Other terms have been used rather loosely for this disease such as June cold, Summer catarrh and Autumnal catarrh. The expression "hayfever" has been commonly used by physicians and laymen for such a long time that it is now generally accepted.

The majority of hayfever cases are attributable to the pollens of weeds, grasses, shrubs and trees which are wind pollinated. Generally the showy flowered plants which are insect pollinated are not a factor in hayfever. One of the characteristics of hayfever is the fact that the patient is affected with the same symptoms each year approximately on the same dates. For this reason hayfever in New Hampshire may be classified into the following types, according to the seasons of plant pollination or flowering.

1. The **spring type**, begins the latter part of March or the first of April, and continues to about the first of June. The etiological agents responsible for this type of hayfever are the pollens of trees, the principal genera in New Hampshire being: Elm, Maple, Willow, Poplar, Birch, Oak, Beech, and Ash.

2. The **summer type**, begins about June 1 and extends to about the middle of July. Summer hayfever is caused by the pollens of grasses, Plantain and Dock. The principal grasses are Red and Meadow Fescue, Meadow Foxtail, Sweet Vernal-grass, June Grass, Orchard Grass, Canada Bluegrass, Timothy, and Redtop.

3. The **fall type**, begins about the middle of August and continues until the end of the growing season. The pollen of Common or Short Ragweed (*Ambrosia elatior*) is the principal cause. The Tall or Giant Ragweed (*Ambrosia trifida*), Solidagos, Cocklebur, and Marshelder occur to such a small extent in New Hampshire as to be negligible.

### Symptoms

The disease usually begins with repeated attacks of nasal irritation and sneezing and is sometimes accompanied by conjunctivitis and bronchitis. The symptoms appear at the start of the blooming season of the plant involved. The onset of symptoms varies with the individual, in some the manifestations are slow and gradual, while in others they are sudden and acute.

The symptoms vary considerably in severity and duration, and may occur with great variation from hour to hour, or from day to day.

Symptoms consist of an itching and sandy sensation of the eyelids, with redness, tickling, burning and itching sensations of the nose. Violent attacks of sneezing may occur, usually accompanied by a clear thin mucous discharge. The mucous membrane of the nose is congested, and when irritation is severe, may cause a complete obstruction to nasal breathing. The ears, roof of the mouth, and throat often-times itch. In addition to these principal symptoms of hayfever, i. e. associated with the eyes and nose, there are severe clinical manifestations that occur rarely in certain individuals.

Seasonal hayfever may affect some individuals throughout all three periods. It is estimated that over 50% of the hayfever patients are sensitive to more than one allergen. An estimated 33% of those with summer type hayfever are also sensitive to the pollen of Ragweed. It is not uncommon for seasonal hayfever to begin in the spring and continue until the end of the growing season. Occasionally typical seasonal hayfever continues on into the winter, ceasing only with the cold weather. Hayfever may lead to secondary infection of the sinuses, and repeated attacks may develop eventually into asthma and bronchiectasis.

### **Treatment**

Seasonal hayfever may be treated by having the patient leave the area in which the pollen occurs during the period when it is present. Spring or summer type hayfever is difficult to get away from unless one is upon the ocean, or in the mountains. Sufferers with the autumn type hayfever may avoid the attack by travelling into some of the pollen free areas. Pollen free air also may be obtained by air conditioning a room (removing pollens by filtration) by any one of the several methods available commercially.<sup>1</sup>

Drug therapy has been used as a temporary expedient to modify the attack. The use of some of these drugs is dangerous and should be administered only under the supervision of a physician.

The treatment of hayfever with pollen extracts has been advocated by some physicians. This usually is done after determining the sensitivity of the individual to various pollens or their extracts. Treatment usually is started several months prior to the pollinating time of the particular offending plants, and continued to the beginning of, or through, the entire season.

### **PATHOGENESIS**

Hayfever is a disease of civilization. It has been estimated by some authors<sup>2</sup> that there are between 4,000,000 and 5,000,000 hayfever patients in the United States. In other words, 3% of the entire population suffer with hayfever. Other authors arrive

<sup>1</sup> R. L. Cecil, M. D., Textbook of Medicine—5th edition.

<sup>2</sup> Piness, G. and Miller, H., J. A. M. A. 85:339—1925



at even higher figures such as 8% (Pipes<sup>3</sup>) and 10% (Service<sup>4</sup>). Scheppegrell<sup>5</sup> estimated in 1922 that there were 1,200,000 hayfever sufferers. It is believed by some authorities that the incidence of hayfever in the United States is increasing continually.

Several theories have been advanced to explain this continual increase, namely:

1. More accurate and prompt diagnosis by physicians.
2. Continual irritation of the mucous membranes by smoke, gases and fumes from factories, chimneys, automobile exhausts, and by atmospheric dusts from heavy traffic.
3. Tension and emotional strain of urban life.
4. Exposure to massive concentrations of pollen through travel by means of automobiles and trains.

Whatever the cause of this increase in hayfever may be, the fact remains that the disease causes a substantial amount of morbidity among the people. Such morbidity also causes great economic losses to the nation through medical expenses, absenteeism from work, and a consequent decrease in industrial production.

It is well known that people will travel long distances, often at great inconvenience and expense, to seek relief from this disease. One of the classic examples is that of Daniel Webster who, while Secretary of State, spent the greater part of the hayfever season in New Hampshire and Massachusetts away from his Washington desk, in search of relief. There is some evidence which suggests that he refused to be a candidate for the Presidency because of his incapacity during the hayfever season. It is known through his letters that he suffered severely from this disease, which he often termed autumnal catarrh and hayfever.

### Summary of Present Knowledge on the cause of Hayfever (Pollinosis)

Present knowledge of the causes of hayfever may be summarized as follows:

1. Hayfever consists essentially in hypersensitivity of the individual to the pollens of weeds, grasses, shrubs, and trees.
2. In order for a susceptible person to contract hayfever, he must be exposed to sufficient concentrations of the pollen to which he is sensitive. The disease most commonly has its onset between the ages of 16 and 35 years, although it may appear in infants and in older people.
3. There appears to be a relationship between the concentration of pollen in the air to which patients are exposed, and the onset, severity and duration of the disease.
4. The concentration of pollen in air is influenced by the

<sup>3</sup> Pipes, D. M., South M. J. 30:1012—1937

<sup>4</sup> Service, W. C., J. A. M. A. 112: 2034—1939

<sup>5</sup> Scheppegrell, W., Hayfever and Asthma. Philadelphia: December 1922

pollinating capacity and density of growth of the hayfever plants. These characteristics are affected by such ecological factors as altitude, topography, soil, precipitation, temperature, sunshine hours, cultivation, and other vegetation. Thommen<sup>6</sup> figured that a single Giant Ragweed plant yields 8,000,000,000 pollen grains in five hours of active pollination.

5. The symptoms appear chiefly during the pollination periods of the offending plants. They can, however, be induced at any time by exposing the patient to sufficient quantities of pollen.
6. Individuals may be susceptible to more than one type of pollen.
7. It has been estimated that 90% of hayfever is due to the pollen of Ragweed.
8. The chemical component of the pollens which causes an allergenic reaction is not definitely known, evidence suggests it is a protein. According to Abranson,<sup>7</sup> the excitants of the symptoms of pollinosis are comparatively small molecules having properties similar to, but not characteristic of, proteins. The allergenic factor is not found on the outer shell of the pollen grain, but is somewhere inside the shell.

### Purpose of Study

The study was undertaken by this Department to determine existing conditions in the State relative to the occurrence and extent of growth of plants which cause hayfever, and the resulting density of pollen in the atmosphere. The study also included the collection and analysis of data on soil types, vegetational types, topography, climactic conditions and other factual data affecting the growth of hayfever plants. The Department believed that the results of such a study would provide for an evaluation of the potential causation of the disease in New Hampshire, and serve as a basis for preventive measures if they are considered necessary.

A large number of inquiries are received yearly from hayfever sufferers requesting information as to locations in the State which are free from hayfever pollens. There was no source from which this information could be obtained. Previous replies were based upon knowledge of locations recognized as being beneficial to hayfever victims due to a trial and error method of exposure.

In the treatment of hayfever patients, physicians often are confronted with the problem of the type of allergens causing the disease. Basic facts must be known to make this determination. Among these are the species of plants which occur in the patients environment, and the types which produce pollen causing the disease manifestations. Such data could only be obtained by the

<sup>6</sup> Thommen: A. A. Hayfever

<sup>7</sup> Abranson: Annals of Allergy—January—February 1947.



physician's own observations and experience. It is planned that through the data obtained from this study, physicians in New Hampshire will be provided with pollination charts which will aid them in their diagnosis. While a few commercial drug establishments have prepared and distributed such charts, it is questionable if the data presented is based upon scientific studies.

New Hampshire is well known as a recreational State because of the excellent natural features which exist within her boundaries. The State also has a reputation among hayfever patients as a place where relief from their symptoms may be obtained. Various towns have inaugurated programs for the control of hayfever plants. Some of these programs are based upon scientific knowledge, others are not.

There has been no cumulative source of information on the morbidity caused by hayfever. It is well known that such morbidity can cause much discomfort and illness, as well as absenteeism and loss of production efficiency among industrial groups. It is the intent of this study to determine basic information on these subjects, and to evaluate existing conditions upon the data obtained.

It is recognized that the degree of growth of hayfever plants and resulting concentration of atmospheric pollen are influenced by many factors from year to year. Data based upon one year's study do not provide sufficient evidence to draw definite conclusions. However, it is our belief that the results here presented are fairly representative and with continual study, as planned, a more accurate evaluation will be made in the future.

Air sampling devices used in this study are those recommended by the National Pollen Survey Committee of the American Academy of Allergy. The final determination of airborne pollen density permits only the exact evaluation of the air at the sampling device, and will not provide data on pollen density at other locations. Pollen density figures given in this report are representative of conditions in the general atmosphere as measured at the sampling point.

It is obvious that airborne pollen concentrations vary with the density of plant growth. Susceptible persons may develop symptoms when exposed to high concentrations from Ragweed growing near their dwellings, or when they travel through areas where Ragweed growth is heavy and at the pollinating stage. The data presented are useful in the evaluation of the concentration of pollens carried by air movement or wind, and in the determination of the magnitude of the hayfever problem. As will be noted in this report, the actual pollen densities at sampling locations were generally low, which indicates that Ragweed growth is the individual problem of each community, since pollens are not of sufficient density to be carried into the community by the winds.

## Previous Studies

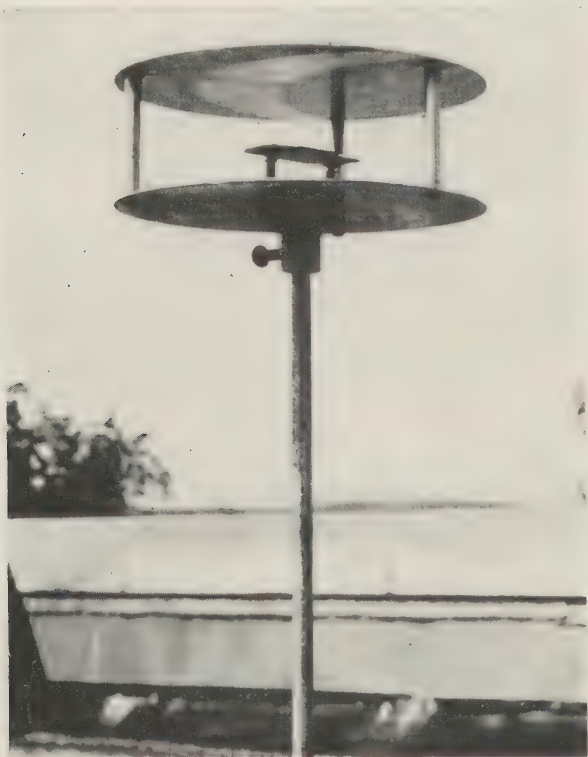
Two surveys relating to hayfever have been made previously in New Hampshire. One was made in 1870 by Dr. M. Wyman, who found that the mountainous parts of northern New Hampshire were free of Ragweed. He concluded that the situation in the southern part of the State was probably similar to that of eastern Massachusetts.

The second study was made in 1934 and 1935 at Bethlehem, in the White Mountains. These studies revealed only traces of Ragweed pollen in the air.

## Methods used in Studies

It will be noted from the information and data presented in this report that the study did not get under way for the season of 1947 until June 22. The 1948 survey will be started not later than March 15th and will be ended October 15th. This will cover the entire growing season from early spring to late fall.

The techniques, equipment, and methods of evaluating the density of airborne pollen were those recommended by the National Pollen Survey Committee of the American Academy of Allergy. Pollens were trapped on greased slides which were exposed in the



"Durham Pollen Sampling Device"



Durham sampling device. This is the standard instrument for air sampling by the gravity slide method which was devised and calibrated by O. C. Durham, and approved by the National Pollen Survey Committee.

The procedure briefly consisted of exposure of a one by three inch glass slide on the stage of a standard sampling device. Slides were exposed in the 12 selected locations each day from June 22, to October 15, inclusive. The slides were coated with a petrolatum jelly to which the pollen grains adhered as they were desposited by air movement.

The sampling device consists of two 9 inch heavy, polished, stainless steel discs set horizontally three inches apart, and held with three struts. One inch above the center of the lower plane is a slide holder into which the slide fits readily. The supporting rod of the apparatus, thirty inches long, rises from a tripod base equipped with holes so that it may be screwed to a solid platform. Slides were received every two weeks at the Department Office in Concord for examination. A staining solution was added to the slides and a 22mm. square cover glass was placed approximately in the center of the slide. The slides were placed under a compound binocular microscope, and the pollen grains counted and identified as to species. The counts were computed and reported on the basis of the number of pollen grains of each species found on a square centimeter of slide area. No attempt was made to supplement the one square centimeter figures with cubic yard estimates. Approximately 1600 slides were exposed and examined by this method.

The slide counts were made by trained bacterologists and biologists. Pollens were provided by O. C. Durham of the Abbott Laboratories for use as standards for identification. Dr. Matthew Waltzer, Chairman of the National Pollen Committee, kindly ran check counts on several slides which were forwarded to him. These counts compared very favorably with those obtained by the Department personnel.



"Identifying and Counting Pollen in the Laboratory"

Supplementing the actual measurement of the density of airborne pollen, a reconnaissance type survey was made of the growth of Ragweed. Observers traveled throughout the State making observations. Maps and records were kept as to the growth, pollinating date, and general habitat of Ragweed.

A questionnaire was included in the Department's monthly publication "Health News" requesting hayfever victims to forward to the Department certain information about their hayfever experience. Results of this questionnaire are discussed further in this report.



## Factors Influencing Growth of Hayfever Plants

Following is a general description of the various natural features of New Hampshire which affect the growth of hayfever plants. The information is necessarily generalized due to the large land area covered. Detailed information concerning the area surrounding the various pollen collecting locations will be given in the discussion of the individual stations.

The following tables are from the U. S. Weather Bureau records for Concord, N. H. These records cover a period of at least 75 years and represent the various mean annual ranges. The information is representative for the entire State up to the medium altitudes, which would cover the major area of the State. All of the pollen collecting stations were well within this zone.

### Comparative Data—Concord, New Hampshire (Averages from all available records, including the year 1946) TEMPERATURE (°F) RELATIVE HUMIDITY

Month	Mean Maximum	Mean Minimum	Mean Monthly	(per cent)			
				1:30 AM	7:30 AM	1:30 PM	7:30 PM
Jan. ....	29.2	8.9	19.0	78	79	56	70
Feb. ....	31.0	9.6	20.3	76	77	54	66
Mar. ....	38.8	20.0	29.4	76	76	52	62
Apr. ....	52.6	30.7	41.6	77	73	46	59
May ....	64.8	40.9	52.9	85	74	49	64
June ....	73.5	49.9	61.7	87	77	52	67
July ....	79.0	55.9	67.4	89	80	51	70
Aug. ....	76.4	54.6	65.5	91	84	53	73
Sept. ....	69.1	47.1	58.0	92	86	53	77
Oct. ....	58.6	37.1	47.8	86	85	53	73
Nov. ....	44.5	26.5	35.5	82	82	61	73
Dec. ....	32.9	15.0	24.0	78	80	58	71
Annual Mean	54.2	33.0	43.6	83	79	53	69

### Comparative Data—Concord, New Hampshire (Averages from all available records, including the year 1946) PRECIPITATION      SUNSHINE      WIND (inches)

		Snowfall (Unmelted)	Number of Hours	Percent of Possible	Average Hourly Velocity	Prevail- ing Dir.
Month	Total	Total	Hours	Possible	Velocity	
Jan. ....	2.98	17.9	139	50	6.1	NW
Feb. ....	2.65	17.3	154	54	6.5	NW
Mar. ....	3.11	11.6	199	57	6.6	NW
Apr. ....	2.97	4.6	205	54	6.9	NW
May ....	3.12	0.1	226	53	6.0	NW
June ....	3.24	T	268	57	5.2	NW
July ....	3.69	0.0	273	57	4.8	NW
Aug. ....	3.50	0.0	261	58	4.6	NW
Sept. ....	3.47	T	198	55	4.8	NW
Oct. ....	3.23	0.1	163	49	5.3	NW
Nov. ....	3.27	5.3	122	44	6.0	NW
Dec. ....	2.89	12.1	112	43	5.9	NW
Annual	38.12	69.0	2323	53	5.7	NW

## NUMBER OF DAYS

Month	Average Cloudi- ness (Scale 0-10)	Clear	Partly Cloudy	Cloudy	Precip- itation 0.01 inch or more	Snow, 0.01 inch (Melted)	Thunder- storms	Fog Dense
Jan. ....	5.5	11	8	12	11	8	#	1
Feb. ....	4.9	12	7	9	9	7	0	1
Mar. ....	4.8	13	8	10	10	5	1	2
Apr. ....	5.2	11	9	10	11	3	1	1
May ....	5.3	12	9	10	10	#	3	3
June ....	4.8	12	10	8	10	0	5	4
July ....	4.7	12	12	7	10	0	6	7
Aug. ....	4.7	13	11	7	10	0	5	6
Sept. ....	5.0	12	9	9	10	#	2	9
Oct. ....	5.3	12	8	11	9	#	1	6
Nov. ....	5.9	9	8	13	10	3	#	3
Dec. ....	5.9	10	7	14	10	6	#	1
Year ....	5.2	139	106	120	120	32	24	44

The precipitation affecting the growth of plants during the normal growing season, is furnished primarily by thunder storms. These records for thunder storms would not cover Zone 1 and probably one-half of Zone 2. The wind velocities as reported in Concord would hold for the entire State, with the exception of the extreme north and along the seacoast, where they would be somewhat higher. The higher altitudes of the State are, with very few exceptions, those in which no major hayfever plants would occur. At these altitudes the land is heavily forested, primarily with the Spruce-Fir type, or is barren rock above timberline. Therefore, these records generally would be indicative of growing conditions for hayfever plants.

Comparison of the Weather Bureau records for 1947 with those of the mean annual records reveals the following: The month of April was normal for precipitation and temperature. The months of May and June had a precipitation slightly above normal, approximately 5%, together with a slight temperature deficiency. The temperature and precipitation for the month of July were slightly above normal. During the month of August the precipitation was about one third below normal, and the temperature somewhat above. The month of September had precipitation about 20 percent under the normal, and a temperature exceeding the mean annual. The month of October was considerably below the normal for precipitation, and had an excess of temperature.

In the latter part of October and the first part of November, New Hampshire had such extreme forest fire weather that a state of emergency was declared. Huge fires raged in New Hampshire, Maine, and Massachusetts. Those fires were a direct result of the deficiency in precipitation during the latter part of the growing season.



The date of the average killing frosts, records extending from 1851 through 1947, were May 5th and October 3rd. The average growing season is 150 days.

During the 1947 season the last killing frost in spring occurred May 15, and the first in the fall on September 27. This would indicate the 1947 growing season to be 135 days, which is 15 days below the average.

The dates of the average growing seasons would not apply to most of the area in Zone 1, and that area in Zone 2 which lies above the medium altitudes. These figures would also be somewhat modified in the coastal area by the effects of the ocean. The growing season decreases from 10 to 20 days from the south to the north.

The total annual precipitation increases from 38 inches in the southern part of the State to 44 inches in the extreme north. The normal summer rainfall increases from approximately 10 inches in the south to 13 inches in the north, these figures are for the months of June, July and August.

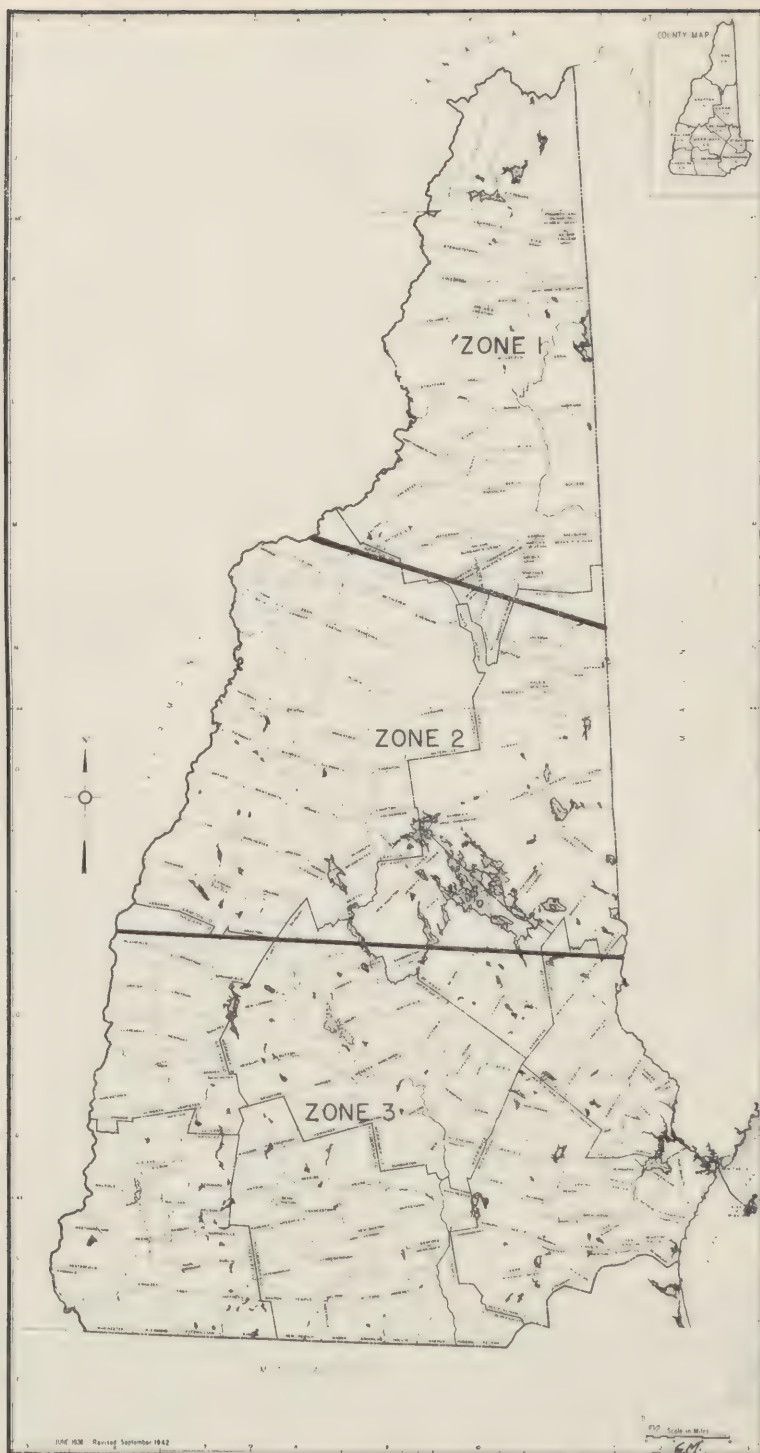
The altitude of New Hampshire varies from zero at the coast to 6,262 feet above the ocean at the top of Mt. Washington. These extremes offer a wide variation of weather, altitude, vegetation, and soils. A comparatively small area of the State exceeds a moderate altitude of 4000 feet.

The State, on the basis of vegetation and topography, can be divided roughly into 3 zones, which are:

**Zone 1** is that area which is north of the White Mountains proper, consisting primarily of Coos County. The topography is rolling, and the soil covered with a heavy stand of Spruce and Fir. The major industries are pulp and other forest industries, farming, and wholesale dairying. This country is also heavily endowed with areas in which the sportsmen and vacationists delight.

**Zone 2** consists of the White Mountains and the National Forest contained in them. These mountains lie slightly above the center of the State in a more or less circular mass. The mountains range from moderately high to rugged peaks, and are dominated by the Presidential Range and Mt. Washington. The entire area is heavily forested, primarily with the Spruce-Fir type, with an admixture of hardwoods. Forest industries, and various tourist enterprises, predominate in this zone.

**Zone 3** consists of the central and southern sections of New Hampshire and ranges from hilly, to a low rolling dissected plateau sloping gently from the White Mts. to the sea. There are occasional mountain peaks isolated in this general plains area which tapers off into the coastal lowland in the southeast. Vegetation in Zone 3 ranges from pure stands of White Pine to pure stands of hard-



"Zonal areas arbitrarily established on the Basis of Vegetation,  
Topography, Population, and Pollen occurrence"



wood. This zone also contains most of the cities and manufacturing industries, together with dairying and poultry raising.

Figure 2 shows New Hampshire's general topography, divided into altitudinal regions increasing from light to dark shading.

Most of the State's soil cover consists of sandy or stony loam, which is excellent for forest growth and farm crops when cleared and when topography is not too severe. The river valleys provide sizeable areas of rich heavy soil. The U. S. Soil Survey classifies soil productivity as 60% non-arable, 29% poor, and 11% from fair to excellent. These figures would indicate that the area of New Hampshire suitable for farming is restricted.

Reference is made to the attached forest timber type map (Figure 4) indicating generally the vegetational zones. The forests consist of approximately 50% softwood or conifers, and 50% hardwoods. The softwood acreage is approximately 29% White Pine and 21% Spruce and Fir. The hardwood acreage is made up of 27% Birch-Beech-Maple; 16% Oak; and 7% miscellaneous. The total forest area in New Hampshire is 4,671,693 acres.

The total land area of New Hampshire, according to figures based on a survey of 1940,<sup>8</sup> can be broken down into the following:

USE	ACRES	PERCENT
Developed in Cities, Towns, Highways, etc.	334,983	5.7
Agriculture (less farm woodland)	723,199	12.5
Barren, permanently treeless bog, rock, sand.	45,485	0.8
Forest	4,671,693	81.0
Total	5,775,360	100.0

From the reconnaissance survey made by this Department it is estimated that less than 10% of the acreage listed for cities, agriculture, and barren would be that on which Ragweed, the main hayfever offender, could occur. Using these figures, less than 2% of the entire land area of New Hampshire is that on which Ragweed would be able to grow.

### Hayfever Plants

The following hayfever plants occur in New England, according to Dr. R. P. Wodehouse in his book, "Hayfever Plants." They are arranged in approximately the order of pollination by zones in New Hampshire. (See Figure 1). Their relative importance within the zones is indicated by use of letters, as follows: H-heavy; M-medium; L-light.

<sup>8</sup> Biennial Report—N. H. Forestry and Recreation Comm.—1945-46

# TOPOGRAPHICAL MAP of NEW HAMPSHIRE

FROM UNITED STATES GEOLOGICAL SURVEY MAPS

SHOWING CONTOUR LINES AT VARIOUS  
ELEVATIONS ABOVE SEA-LEVEL, SHADING  
FROM LIGHT TO DARK AS ELEVATIONS INCREASE

0-200 200-500 500-1000 1,000-2,000 ABOVE 2,000

SCALE IN MILES



NEW HAMPSHIRE  
STATE PLANNING BOARD

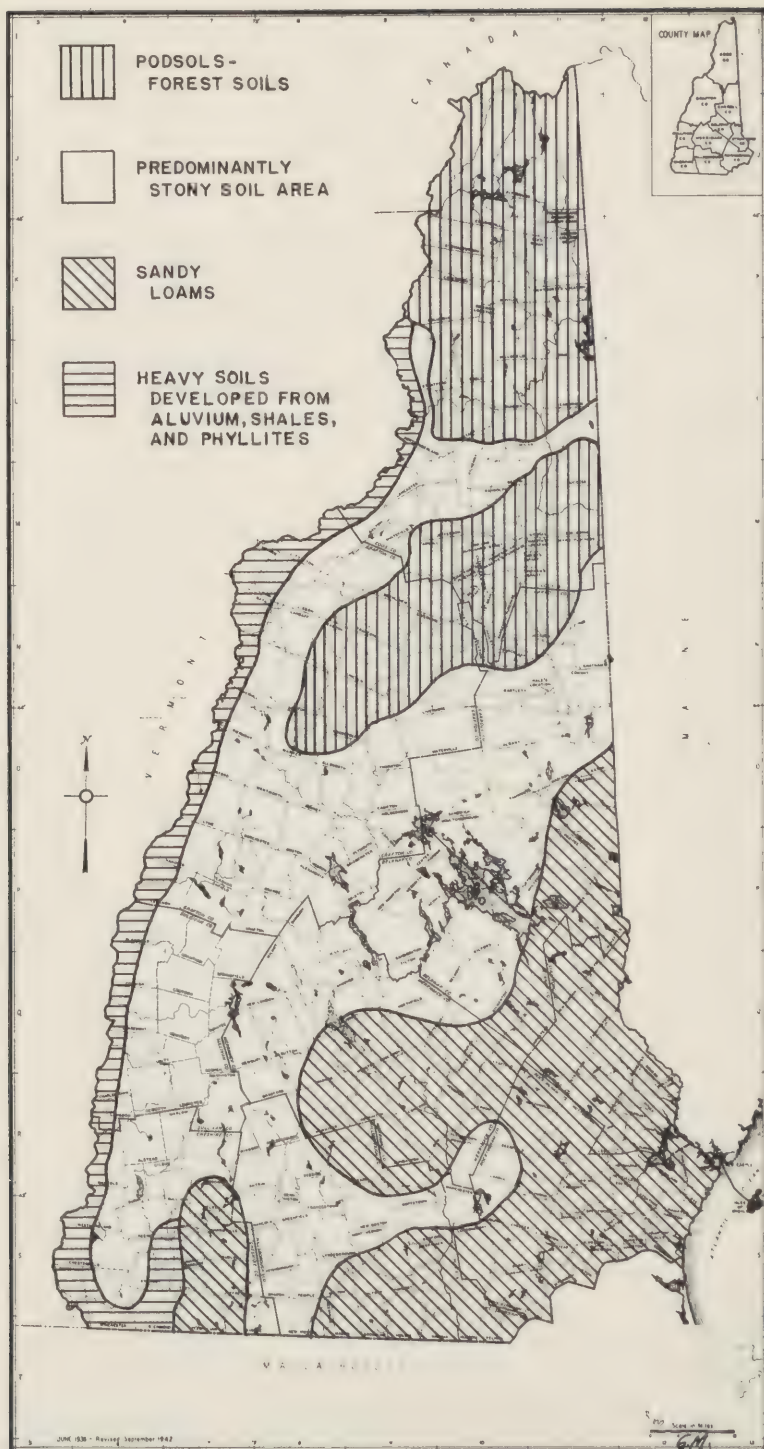


Figure #2—General Topography by Altitudinal Region



<i>Species</i>	<i>Spring Season</i>			<i>Summer Season</i>			<i>Fall Season</i>			<i>Winter Season</i>		
	<i>Zone</i>			<i>Zone</i>			<i>Zone</i>			<i>Zone</i>		
	1	2	3	1	2	3	1	2	3	1	2	3
Elms ( <i>Ulmus</i> )	L	L	H									
Maple ( <i>Acer</i> )	L	L	L									
Willow ( <i>Salix</i> )	L	L	L									
Poplar ( <i>Populus</i> )	L	L	L									
Birch ( <i>Betula</i> )	H	H	H									
Oak ( <i>Quercus</i> )	L	L	H									
Beech ( <i>Fagus</i> )	L	L	L									
Ash ( <i>Fraxinus</i> )	L	L	L									
Meadow Foxtail ( <i>Alopecurus</i> <i>pratensis</i> )				L	I	L						
Sweet Vernal Grass ( <i>Anthoxan-</i> <i>thum odora-</i> <i>tum</i> )				II	M	II						
English Plantain ( <i>Plantago</i> <i>lanceolata</i> )				I	M	II						
June Grass ( <i>Poa pratensis</i> )				II	II	II						
Orchard Grass ( <i>Dactylis</i> <i>glomerata</i> )				II	II	II						
Sorrel Dock ( <i>Rumex ace-</i> <i>tosella</i> )				L	L	L						
Red Fesque ( <i>Festuca</i> <i>rubra</i> )				L	L	L						
Meadow Fesque ( <i>Festuca</i> <i>elatior</i> )				L	L	L						
Canada Blue Grass ( <i>Poa com-</i> <i>pressa</i> )				L	L	II						
Timothy ( <i>Phleum</i> <i>pratense</i> )				II	L	II						
Red Top ( <i>Agrostis</i> <i>alba</i> )				II	L	II						
Marshelder ( <i>Iva oraria</i> )				L	L	L						
Goldenrods ( <i>Solidago</i> )							L	L	L			
Short Rag- weed ( <i>Ambrosia</i> <i>elatior</i> )							M	L	II			
Cocklebur ( <i>Xanthium</i> )							L	L	L			

"Table #2—Hayfever Plants in New Hampshire and Their Relative Zonal Importance"



"Figure #3—New Hampshire Soil Types Areas—U. S. Soil Survey"

The most important of these species in New Hampshire are: Spring or tree season—Oak and Birch. Summer, or grass season—Sweet Vernalgrass, English Plantain, June Grass, Orchard Grass, Timothy, and Red Top. In the fall season, Ragweed is the most important species pollinating, and in fact Ragweed is the main offender in the State. Meadow Fescue, Meadow Foxtail, Lambs Quarters, Artemisias, Cocklebur, Tall Ragweed, and Marshelder occur so infrequently, or in such small stands, that they are not major causative agents of hayfever in this State.

The pollination period for Elm, Maple, and Willow was over before the present study commenced. There were no pollen grains of these genera present on the exposed slides. Pollen grains of Poplar, Birch, Ash, June Grass, Orchard Grass, and Timothy, appeared on the slides June 22, the first day slides were exposed. Beech pollen appeared for the first time on June 26. Oak pollen first was found on the slides July 6. The first recorded date for Short Ragweed was August 15. Pollen of no other species listed by Wodehouse (Table #2) were found on the slides.

### **Location of Sampling Stations**

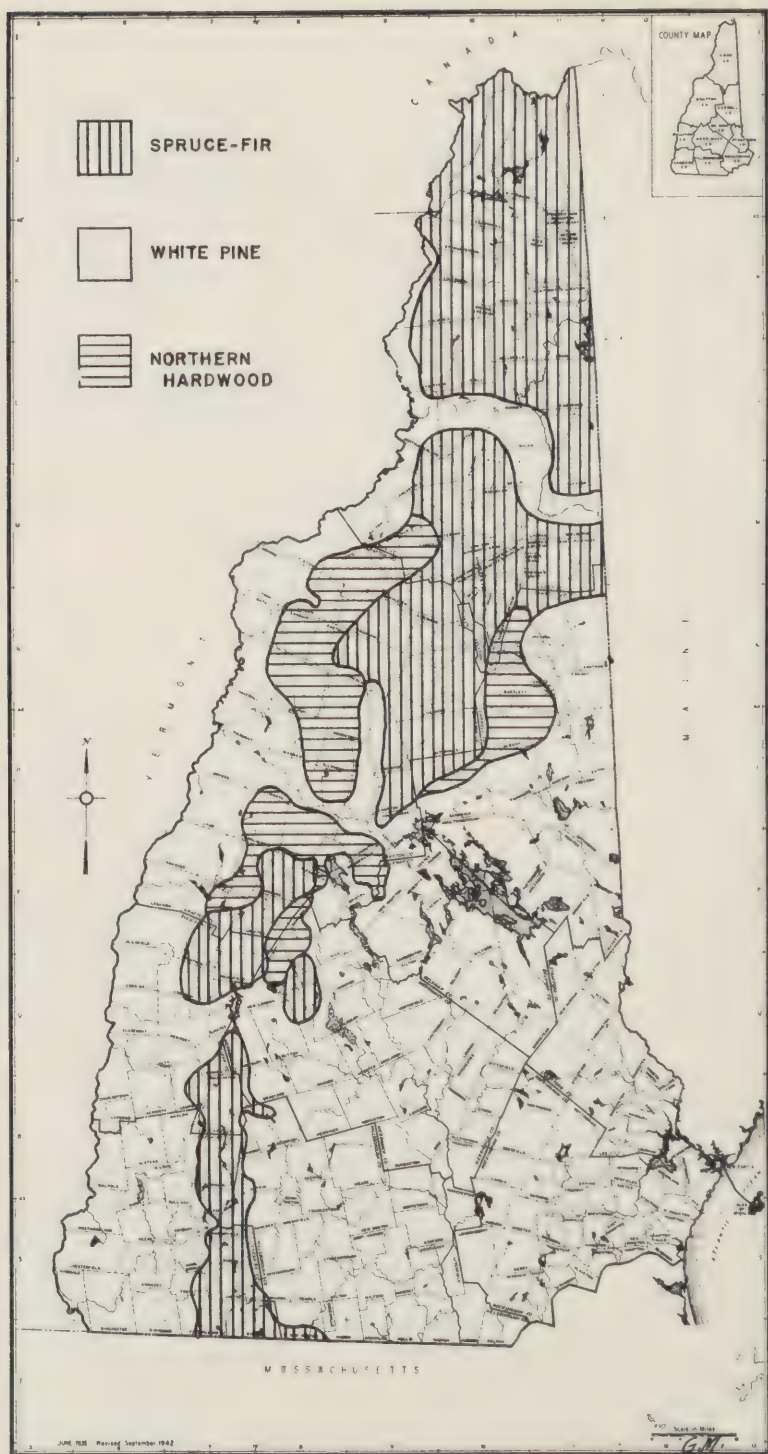
Pollen collection stations were located approximately 50 air miles apart. Reference is made to Figure # 5 indicating station location and distribution.

Stations were located wherever possible at places having personnel on duty seven days a week. Through the cooperation of the State Fish and Game Department, personnel at four fish hatcheries changed the slides daily. Professor F. E. Hodge of Colby Junior College, while making daily weather observations, assisted in this study. Other stations were located at the homes or offices of various local health officers. Three of the stations were at the offices of personnel of the State Health Department.

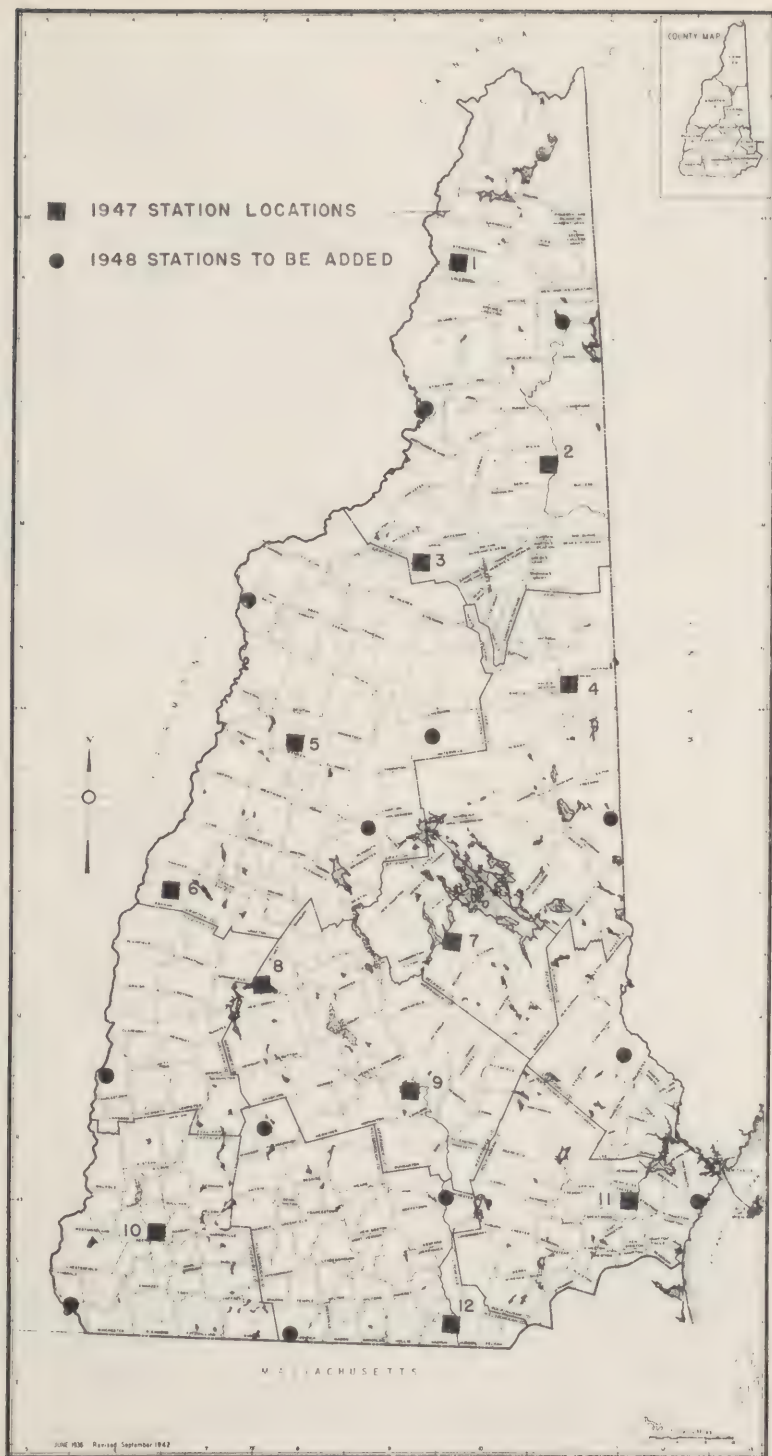
It was thought that representative sampling could be attained by spotting the stations as nearly the same distance apart as possible throughout the State. They were located from the Spruce-Fir forest type area in the North to the border of the State of Massachusetts; and from the seacoast area on the East, to the Beech-Birch-Maple forest in the south-west. Vegetation, soil, altitude, and population were considered in the location of sampling station distribution.

A further attempt was made to obtain a representative sample by placing the pollen collecting devices on different sites at the various stations. Some were on the roofs of the highest buildings in the largest cities, one on the crest of an open grassed area at an altitude of 1345 feet; some located in areas surrounded by farms, and others located in forested areas. Check slides were exposed in the City of Concord during the height of the Ragweed season in an attempt to determine any possible difference between having the pollen collecting device on the top of a high building, (State House Annex) and one located at the home of one of the Health Department employees.





"Figure #4—Forest Timber Type Map H. I. Baldwin—N. H. Forestry and Recreation Department"



"Figure #5—Location of Pollen Collection Devices"

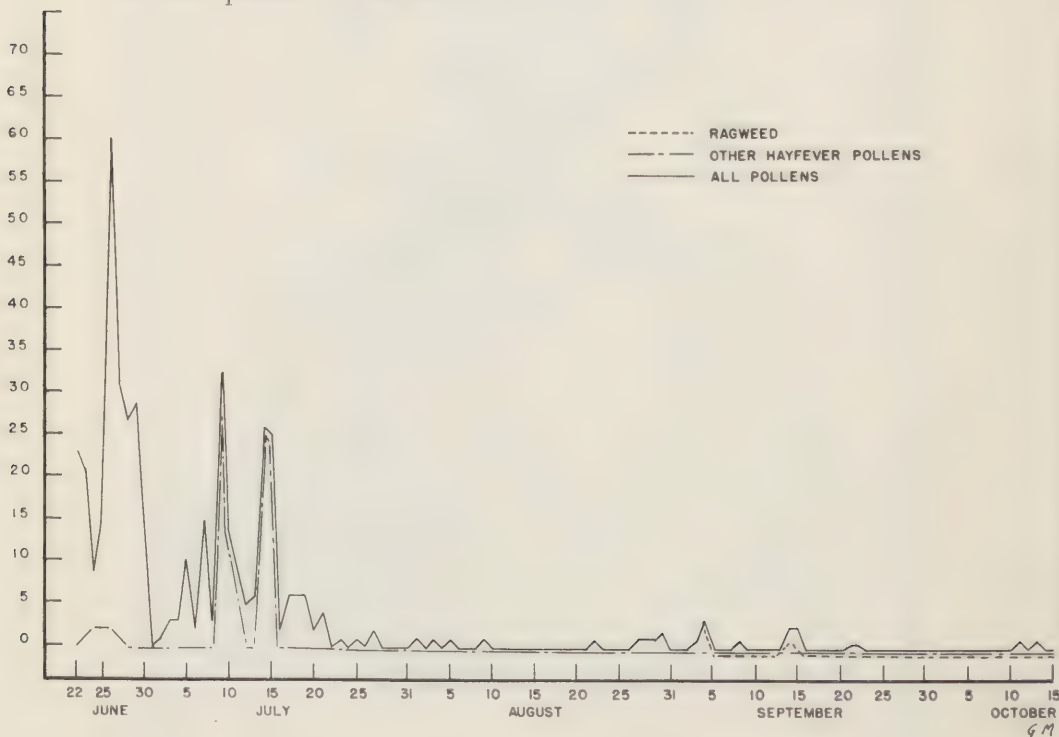
## Results of Studies at Sampling Stations

Each sampling station has been dealt with separately in respect to airborne pollen density, Ragweed growth, and other factors relating to the incidence of hayfever. The basis for the evaluation of Ragweed growth is discussed in detail under the section on reconnaissance surveys.

STATION # 1 was located about 2 miles east of the Town of Colebrook, in the Mohawk River Valley, at an altitude of 1100 feet. The device was handled by the employees of the Colebrook Fish Hatchery, where the collecting device was placed. This hatchery is in a shallow valley, with a southern exposure. A Spruce-Fir forest surrounds the hatchery on three sides, the southern side being an old field of an abandoned farm. The station was partly protected from winds, but not to such an extent as to interfere with any pollen which might be carried through the general atmosphere.

There was no Ragweed found within the immediate vicinity of the pollen collecting station. There was, however, a scattered and light growth of Ragweed in a few places in the Town of Colebrook.

The following graph indicates the density and frequency of airborne pollens at this site:



"Station #1—Daily Pollen Occurrence"



Birch pollen occurred daily from June 23 to June 28 inclusive, the largest number showing on any one day being two grains per square centimeter.

The pollen of Orchard Grass appeared on the slides for one day only on July 9.

Timothy in relatively small numbers appeared on the slides on July 9, continuing to July 11. Timothy reappeared July 13 and continued to July 16.

From July 16, until the occurrence of Ragweed, September 4, no pollens of the types generally considered as causing seasonal hayfever appeared on the slides. Grass pollen appeared only four days out of this period in amounts exceeding ten grains per square centimeter slide surface.

The graph indicates that Ragweed pollen appeared on the slide September 4 for a count of three grains per square centimeter, and September 14, when only one grain was found per square centimeter. Ragweed hayfever, as indicated from these counts, is not a problem in the area surrounding this station.

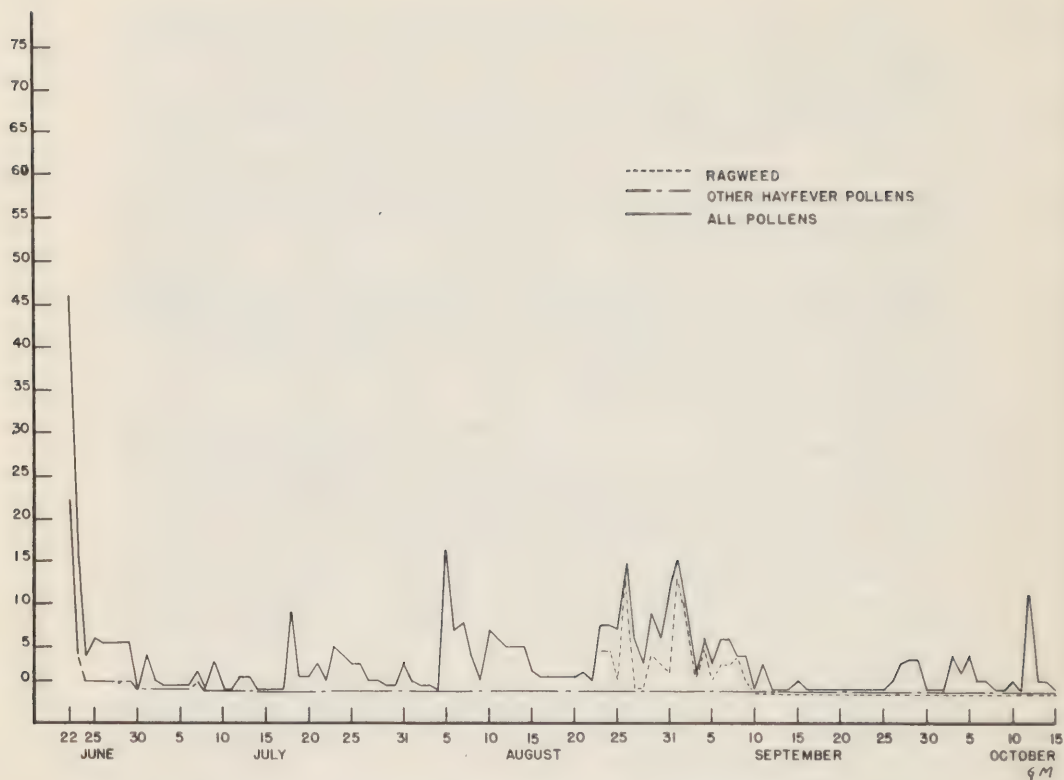
These data indicate that the area in and around Colebrook, excepting for one week out of the entire period studied is relatively free from airborne hayfever pollen.

STATION # 2 was located in the City of Berlin, on the roof of the highest building, at an elevation of 1110 feet. The station was maintained by employees of the State Health Department and the City Health Officer.

The City of Berlin is located in the narrow valley of the Androscoggin River. The Presidential Range of the White Mts. lies as a barrier about 10 miles to the south. The river valley at Berlin runs directly north and south, and is protected on the west side by a low range of hills. Berlin is actually located at the hub of six valleys which radiate like the spokes of a wheel. The City is surrounded primarily by a Spruce-Fir forest which supplies wood for the Brown Paper Company. There are a few small farm scattered through the woods and valley bottoms. The station was exposed to the full sweep of the wind in all directions.

Surveys for Ragweed revealed dense growths throughout mill yards, along the many railroad tracks, in vacant lots, and around residences. There was little Ragweed in the valley to the north, but heavy growths were noted in the City, and through the valley to the south.

The following graph indicates the daily occurrence of airborne pollens at this location:



"Station #2--Daily Pollen Occurrence"

An examination of the graph of Station 2 indicates that the first day a slide was exposed, Birch pollen occurred in such abundance as to be an irritant to susceptible persons, with 22 grains per square centimeter being counted. Birch continued until June 26 after which it was not again encountered on the slides.

June grass occurred once, on July 7, when one grain was recorded.

Timothy occurred once on the slides, July 9, when only three grains of pollen were seen.

No other grass pollens were encountered at any time.

Ragweed first occurred on August 23, when five grains were counted. Ragweed pollen continued to appear on the slide every day, except August 27 and 28, until September 10. One grain only was found September 15. The greatest concentration of Ragweed found at one time was fourteen grains per square centimeter of slide surface.

Counts at this station indicate that there were three days in which hayfever inducing pollens occurred in the general air to such an extent as to be conducive to symptoms of hayfever. These days were August 26, and September 1 and 2. Near the local areas

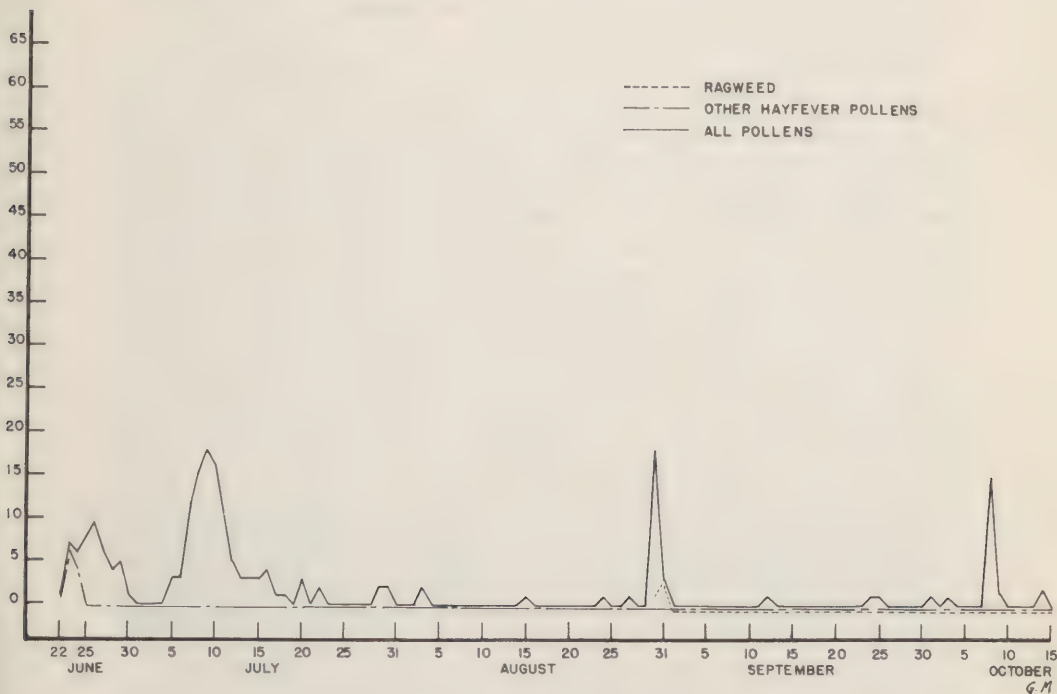
in which Ragweed growths were heavy, the air would be more highly contaminated with pollen.

STATION # 3 was located in the Township of Carroll, about two miles north of the Village of Twin Mts., at an altitude of 1340 feet. This station was maintained by the employees of a State Fish Hatchery, and was located in the center of the trout rearing area. The hatchery is located at the south end of the heavily forested Cherry Valley. The surrounding timber types are primarily Spruce-Fir, with a mixture of Poplar and Birch. There are a few scattered farms in the area.

The presidential Range of the White Mts., lies about six miles to the south of this location. The collecting device was so located that it was exposed to the wind from all quarters, the only interference with air movement being a low hill about 500 yards to the south of the device.

An examination of the surrounding area was made for Ragweed plants. Those growths found were scattered and few in number. Ragweed was classified as light even beside the main traveled road, and along the railroad right-of-way in such locations as are generally heavily infested.

The following graph indicates the occurrence and densities of the various pollens.



"Station #3—Daily Pollen Occurrence"



Examination of the data for Station # 3 indicates that Birch pollen occurred from June 22 to June 24, inclusive. There were only two grains showing on the 22nd, and one grain apiece on the other two days. The pollen of Birch in this area is evidently not occurring in sufficient quantities to be detrimental.

In the grasses, the pollen of Orchard Grass occurred June 23 and 24. These were the only two days throughout the season in which any of the grass pollens appeared on the slides. The greatest number occurred on June 23 when five grains were counted. The airborne pollen of grass does not seem to occur in sufficient quantities to constitute a hazard.

Ragweed pollen appeared on the slides August 30 and 31. No Ragweed pollen was found at any other time during the period of slide exposure. The highest count was August 31, when three grains were recorded.

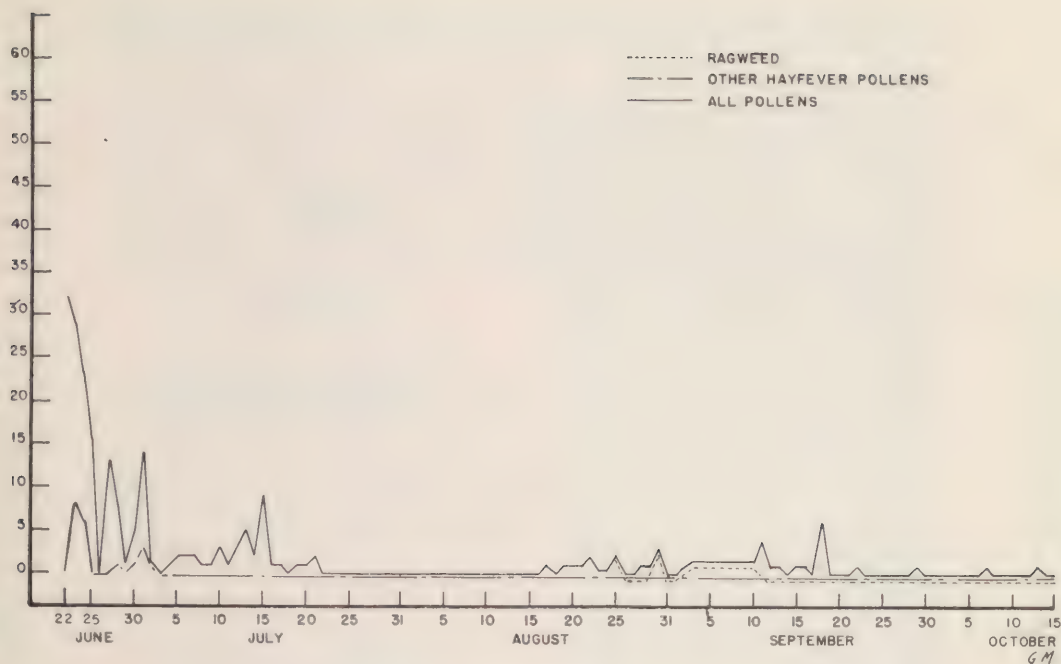
This station from June 25 until August 29 inclusive, had no pollens occurring which would be conducive to causing hayfever. At the time in which the pollens did occur, they occurred in such densities as to be considered negligible as far as seasonal hayfever is concerned.

STATION # 4 was located in the center of the Township of Conway, at an altitude of 520 feet. The collecting device was in the yard of the local health officer and was supervised by him throughout the season.

North Conway is in the Saco River Valley about five miles south of the point at which Pinkham Notch and Crawford Notch come together, and eight miles below the White Mts. The Town is situated on the northern edge of a large glacial outwash plain, and is on generally level land. A National Forest partly surrounds the region, which is noted for its winter sports and summer vacationists. Dominant timber types are Spruce-Fir on the heights, merging into White Pine, Pitch Pine, and Oak on the plains. There are a few farms which are primarily engaged in dairying.

The pollen device was open to the wind from all directions, excepting the east, where it had a slight interference from the home of the health officer. The only other interference was a large Elm tree which stood near the device and shaded it to some extent.

An ocular survey of the surrounding area indicated a small amount of Ragweed, occurring in a more or less scattered manner. There were no extensive growths occurring. The area to the north was almost completely free of the plant. The following graph indicates the occurrence of the various pollens during the season:



'Station #4—Daily Pollen Occurrence'

An examination of the graph and records indicates the following:

Birch pollen appeared on the slide the first day it was exposed, June 22, and continued to June 24. Birch reoccurred once on each of the following dates; June 28, June 30, and July 1. The greatest number of Birch pollen grains was counted June 28, at which time eight grains were recorded.

The pollens of the various grasses causing summer hayfever did not appear on the slides at any time throughout the entire season. This probably is due to the heavily forested character of the surrounding territory.

Ragweed occurred at this station for the first time August 25, when two grains appeared. The only other time that Short Ragweed occurred was on September 3, when seven grains were counted on the slide. At no other times was Ragweed noted in this area.

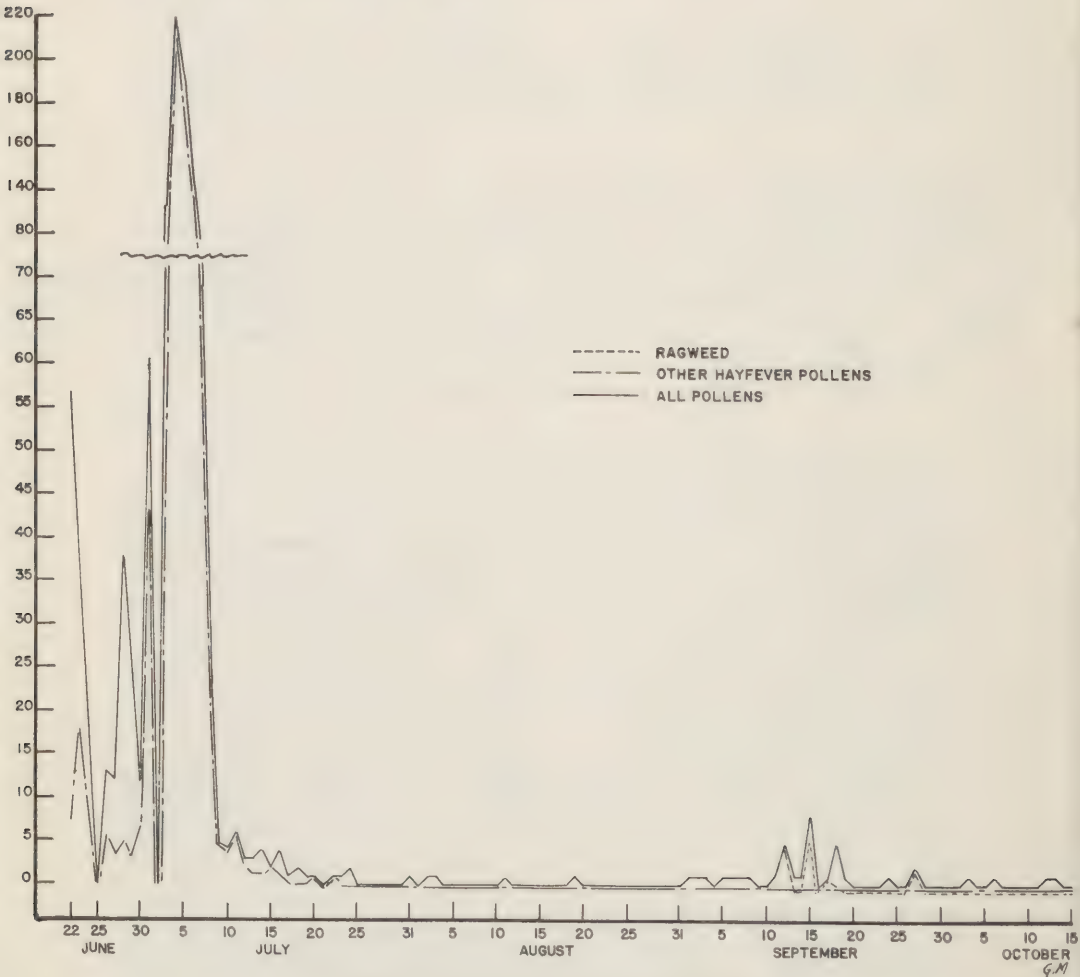
It would appear from the foregoing that the incidence of summer and fall hayfever in this area should be very slight. Ragweed pollen occurred on only one day in amounts sufficient to cause hayfever symptoms.

**STATION # 5.** This station was operated by employees of the Warren State Fish hatchery, which is at an elevation of 700 feet. The hatchery is located in a wide valley of the White

Mts., on the banks of the Baker River. The valley runs generally north and south at Warren with the main mountain ranges at the north and east.

The surrounding area is heavily forested, primarily Spruce and Fir, with a heavy admixture of various hardwoods. Extensive stands of White Pine appear at the lower elevations. There are a few small farms in the valley, most of which are engaged in general farming.

The following graph indicates the occurrence and density of the various hayfever pollens:



"Station #5—Daily Pollen Occurrence"

Examination of the records and graph of this station reveals that Birch occurred on June 22 and 23. On neither day did the count rise beyond five grains of pollen per square centimeter of



slide area. This is below the number suggested that may cause hayfever in susceptible individuals.

Ash pollen occurred the same two days, June 22 and June 23. The greatest density occurred on June 23 when seven grains were counted.

These were the only two days throughout the season when the pollen of trees causing hayfever appeared on the slides.

The only grass pollen occurring was Timothy, which contributed one grain the first day, and continued on to July 16, with only June 25 and July 2 as blank days. There was a lapse of three days and Timothy reoccurred on July 20 with one grain, and July 22 with one grain. This was the last occurrence of any grass during the study period. The days from July 1 to July 8, excepting July 2, were the only ones in which the Timothy pollen count exceeded ten. It varied from 23 grains on July 8 to 215 grains on July 4. In the five days from July 3 to July 7, inclusive, the count ran from 69 to 215.

An investigator made inquiries at the fish hatchery and its surrounding territory as to the probable cause for this high count. It was found that a farmer carried on his haying operations, during this period, on a field approximately 200 yards from the pollen device. A high percentage of his crop was Timothy, therefore, it is postulated that the haying operation was responsible for this high count.

There were no hayfever inducing pollens found on the slides from July 23 to September 11 inclusive.

Ragweed occurred September 12, 15, 17, and 27. On only two days of the four in which Ragweed occurred did the grains reach a count of five. It would seem from these figures that Ragweed, at present, is not an important problem in this area.

It can be concluded that the hayfever problem in this area is one which should cause no concern. The only time the counts were excessive were those days on which haying operations were being performed. These counts only occurred then due to the fact that the hay field was so near to the collecting device.

**STATION # 6** was located on the outskirts of Lebanon, on the lawn of the town clerk's residence at an altitude of 600 feet. Lebanon is in the wide, shallow valley of the Mascoma River about three miles from the Connecticut River Valley. General exposure is southwest, the Mascoma River flowing from east to west.

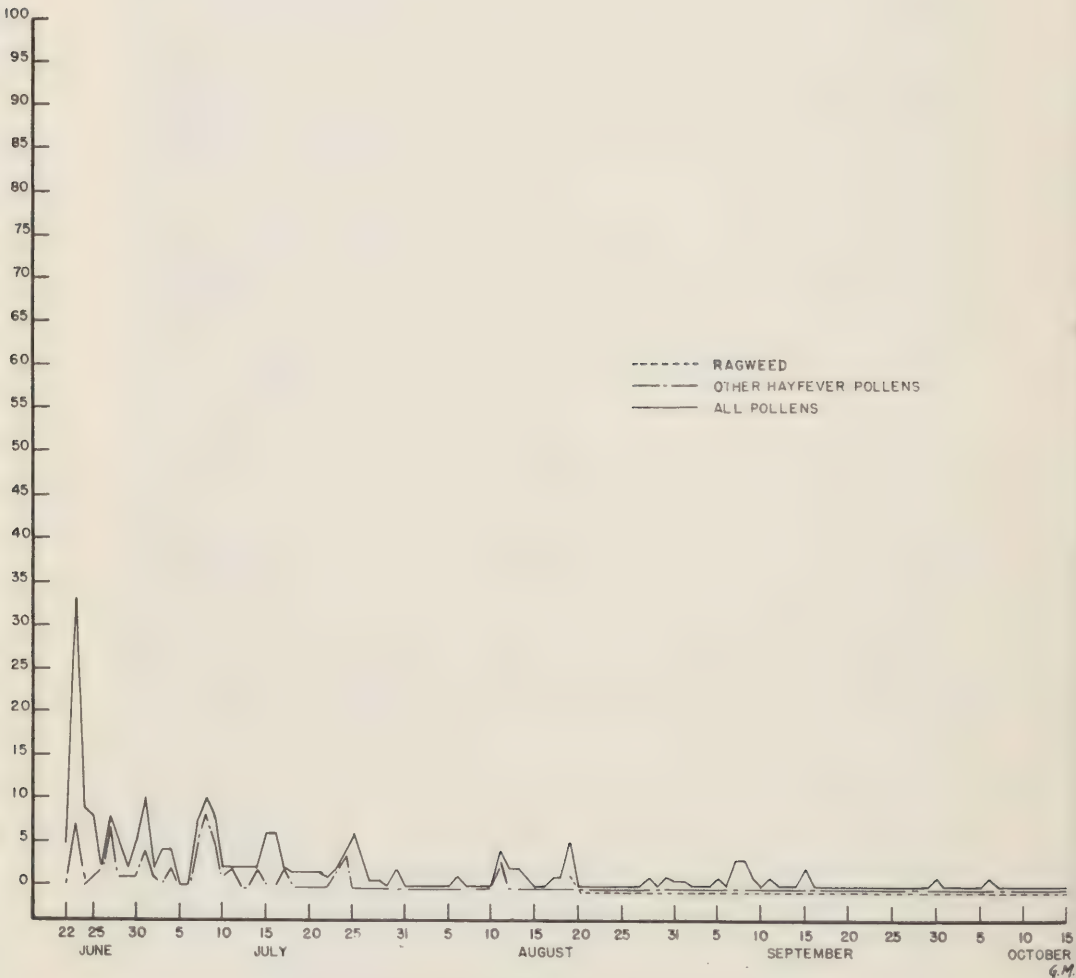
The surrounding area has many large dairy farms, and is intensively cultivated. Timber types in the adjacent hills are predominately White Pine, with an intermixture of various hardwoods principally Beech, Birch, and Maple.

The collection device was somewhat shielded on the north-east side by a small barn situated about 100 feet away. There are

a great many Elm trees throughout the Town, one of which partly shaded the sampling device.

The reconnaissance survey for Ragweed plants classified the growth for most of the surrounding territory as being from moderate to heavy. There were no plants immediately adjacent to the site of the collecting device.

The following graph shows the density and occurrence of pollen:



"Station #6—Daily Pollen Occurrence"

Examination of the records and graph from this collection station indicates the following:

Three grains of Poplar pollen were found on the slide, in a one square centimeter count on June 23. Poplar pollen did not appear again on the slides.

Birch pollen appear on June 23 and 27; and on July 1, 2, and 9. The highest count per square centimeter was June 23 when four grains were recorded.

Beech pollen was found on one day, June 26, when one grain was recorded. Beech did not occur at any other time.

The pollen of June Grass was recorded June 25 to June 28 inclusive. These were the only four days in which June Grass did appear. The highest count was made June 27 when four grains of pollen was seen.

Orchard Grass appeared on the slides June 29 and June 30, one grain each day. In July the pollen was recorded the 1, 4, 7, 8, 9, and 14. The greatest number occurred on July 8, when eight grains appeared.

Timothy put in its appearance at this station for the first time July 10. The only other days on which it appeared were July 11, 17, 23, and 24. The greatest number of pollen grains recorded at any time was July 24 when four were found.

Ragweed occurred once, on August 19, when one pollen grain was found. Ragweed was not found at this station at any other time.

It appears from these data that the problem of hayfever in this locality is not a major one in respect to contamination of the general air with offending pollens. Heavy growth of Ragweed in certain areas would cause air contamination in the vicinity of these areas.

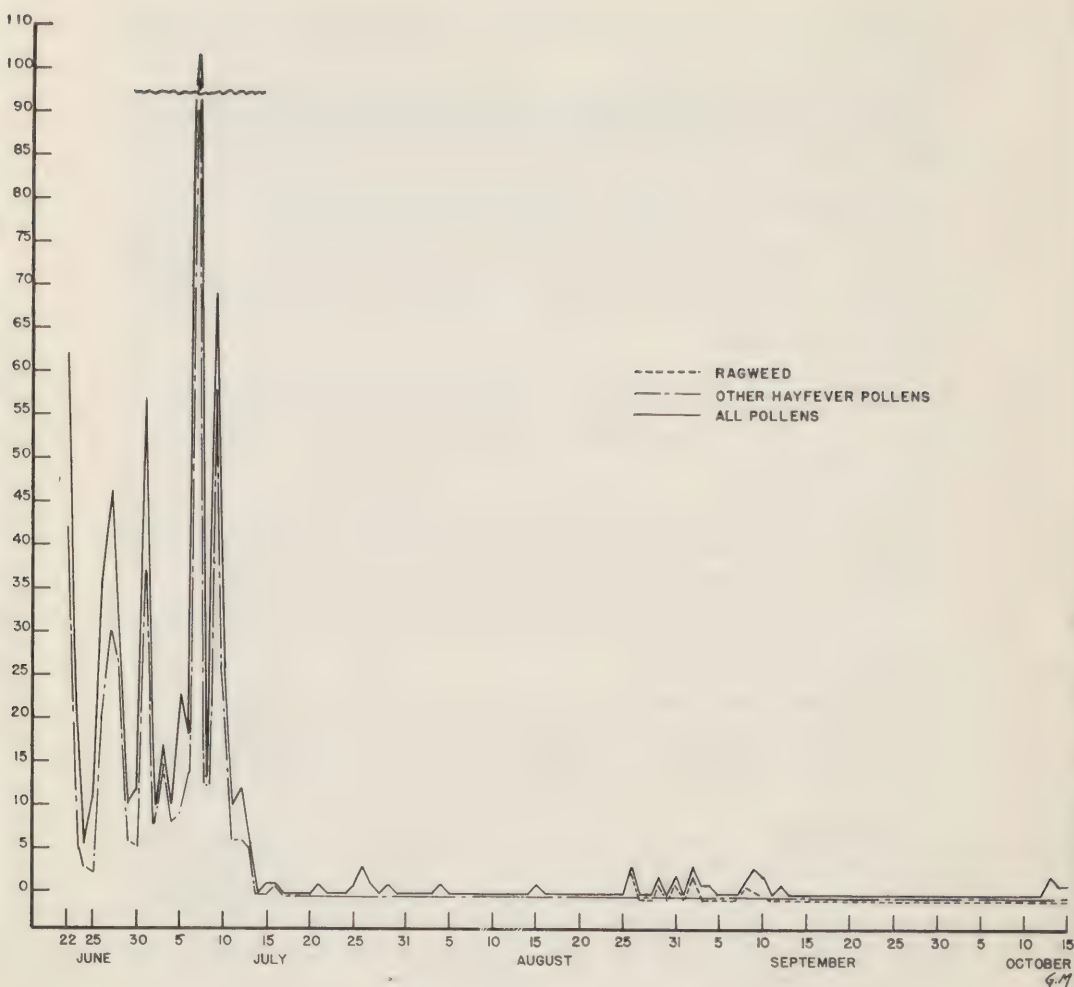
**STATION #7** was located at a State fish hatchery about one mile south of Laconia at an elevation of 580 feet. The collecting device was maintained by employees of the State Fish and Game Department. This hatchery is located about three miles from Lake Winnepesaukee on the south slopes of the lake basin. The exposure is generally north and slightly west.

The surrounding timber type is predominately White Pine with a mixture of Birch and Poplar. The area immediately north and some to the west of the hatchery is used for farming. The collecting device was located in such a manner that there was no interference to the wind in any direction, and small possibility of pollution from other sources.

An examination of the surrounding area revealed a moderate density of Ragweed plants to the north, and a relatively heavy occurrence in the City of Laconia.

The following graph indicates the daily densities of hayfever pollens at this location:





"Station #7—Daily Pollen Occurrence"

Examination of the records and graph for this station reveals the following facts:

The pollen of Birch was found on the slide the first day it was exposed, June 22, and continued to June 24. Birch pollen was also recorded June 26, 30, and July 1. The highest count occurred on June 22, when thirteen grains were recorded. The pollen did not exceed three grains per square centimeter on the other five days in which Birch was found.

The pollen of Beech was seen on one day, June 27, when two grains were recorded.

There were no other tree pollens, generally considered as hayfever inducing, found during the period these slides were exposed.

June Grass occurred June 22, the first day the slides were exposed, and continued up to and including the 28th. These were the only days in which June Grass appeared. The highest count was made June 26, when eighteen grains were recorded.

Orchard Grass occurred June 22, the first day a slide was exposed, and on June 23. There was a lapse of two days, then it reoccurred on June 26 and continued until July 13. It was last recorded as appearing on July 16. There were nine days in which Orchard Grass occurred in densities of more than ten. These were June 22, and 27; and July 1, 3, 6, 7, 8, 9, and 10. On July 7 there were a total of 103 grains of pollen counted per square centimeter of slide area. This period was one in which the owners of the surrounding farms were doing their haying, causing the count to jump to this extreme figure.

No other grass pollens were recorded as occurring on the slides exposed at this station.

The pollen of Short Ragweed appeared here first on August 26. There was a lapse of two days and reoccurrences were August 29 and 31; and September 2, and 8. The highest count on any of these days was three grains of pollen per square centimeter of slide area.

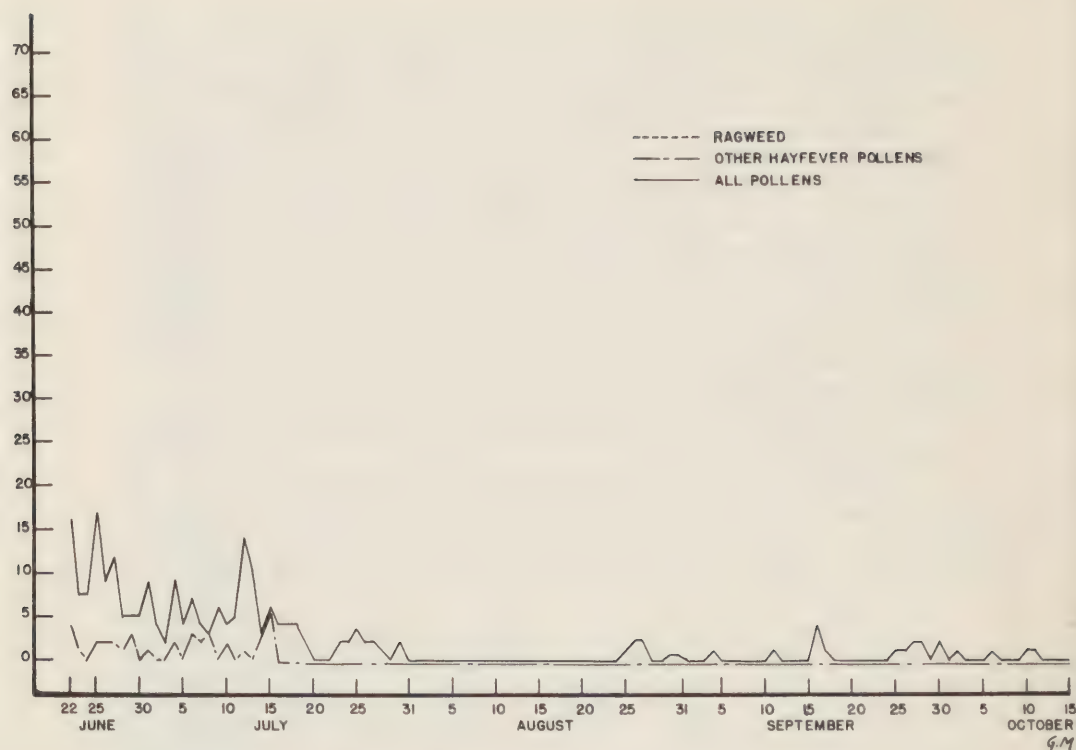
The data indicate that the seasonal hayfever situation in spring and fall is not serious in respect to contamination of the general air. The summer hayfever pollens are present in sufficient quantities to cause some trouble to persons allergic to those particular species. The moderate to heavy growths of Ragweed plants in certain areas at this location would cause an increase of the pollen density in the air surrounding these areas.

**STATION #8** was located at Colby Junior College in New London, at an altitude of 1345 feet. It was situated in the midst of a campus area, at the crest of a series of rolling hills, which drop off into the Connecticut Valley in the far distance. The only obstruction to air movement was a school building about 100 yards south of the station site.

There are some small farms in the area, none of which were close to the collecting site. The surrounding forest is primarily White Pine, with a mixture of Birch, Beech, Maple and Spruce-Fir types.

A survey of the vegetation within a half mile of the campus was made for Ragweed plants. Those found were scattered and in very small concentrations. The entire area might be said to be generally free of Ragweed.

The following graph shows the daily variation in airborne pollen densities in this area:



"Station #8—Daily Pollen Occurrence"

Examination of the records and graph for this station indicates the following:

Pollen from the Birches occurred on the slide the first day it was exposed, June 22 and repeated on June 23, 26, and 27. At no time did it exceed four grains per square centimeter of slide surface.

Beech pollen occurred on only one day, June 26, when one grain was recorded.

Orchard Grass appeared on the slides on June 25, 28, 29, and 30; and July 1, 4, 6, 7, 8, 10, 12, and 14. The counts did not exceed three grains per square centimeter of slide surface on any day.

The only other pollen occurring on the slide was that of Timothy, which appeared one day only, July 15, when six grains per square centimeter were recorded.

The pollen of Ragweed did not appear on the slides at any time during the course of the study.

From the data as determined at this station, it would appear that this area is generally free from all hayfever inducing allergens considered in this study.

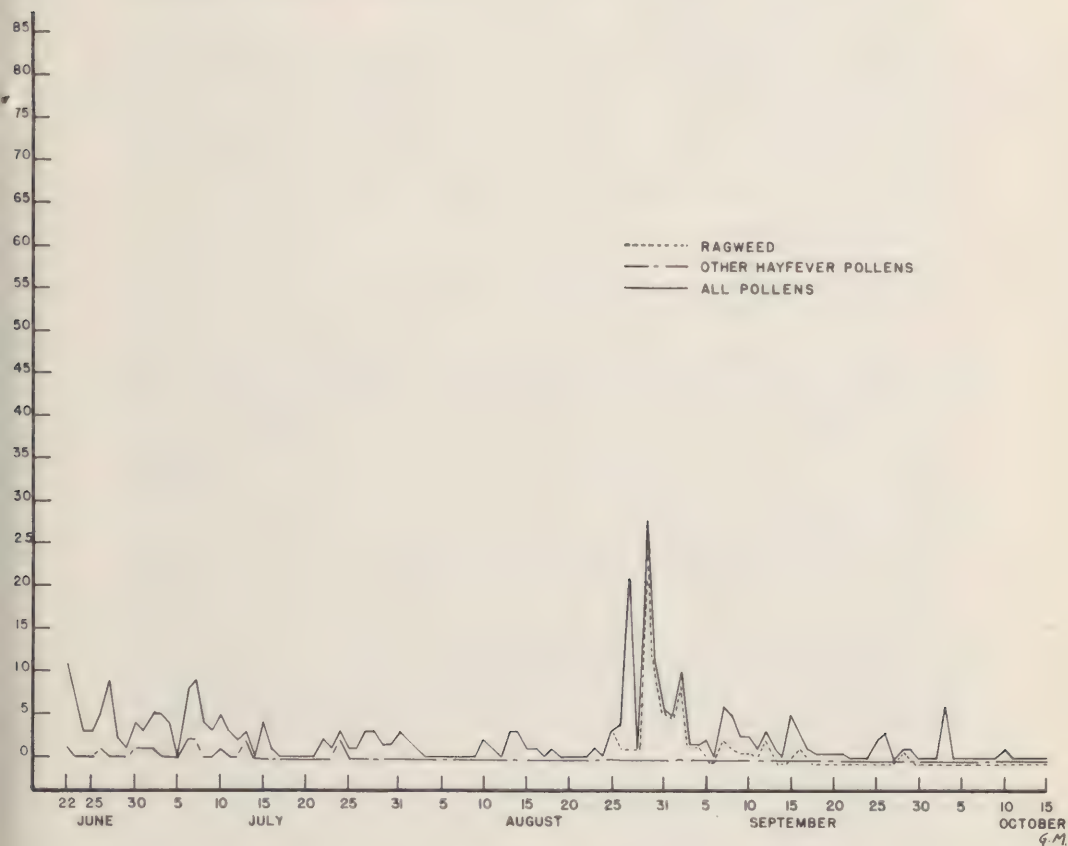


**STATION #9** was located at Concord on top of the State House Annex. This is one of the highest buildings in the City, and is situated approximately 340 feet above sea level. The station was maintained by the staff of the Division of Industrial Hygiene. The only major interference to the sweep of the wind at this station was that caused by the State House dome, which was approximately 200 yards north-east of the pollen device.

Concord is located in the wide Merrimack River Valley, which runs north and south, and is bordered on both sides with low hills. The surrounding area is farmed to some extent, primarily for dairy and vegetable products. Predominating timber types are approximately 50% White Pine and 50% mixed hardwood.

A survey of the surrounding area for Ragweed plants indicated moderate to heavy growths. These occurred on the street burms, in vacant lots, around the edges of peoples' gardens, and in other waste areas.

The following graph shows the daily density and character of pollen at this station:



"Station #9—Daily Pollen Occurrence"

From the records and graph made of pollen concentrations at this station, the following can be educed:

One pollen grain of Birch occurred on each of the following days, June 22, 26 and 30; and July 1 and 2. These were the only days in which Birch did occur.

One grain each of Oak and Ash pollen was found on July 6.

These were the only times at which any of the tree pollens under study occurred.

The pollen of Orchard Grass occurred only on July 7, when two grains per square centimeter of slide area were recorded.

Timothy pollen was found July 10, 13, and 24. The concentration did not exceed two grains per square centimeter of slide area.

The pollen of Short Ragweed occurred from August 25 to 31 inclusive; and September 1, 2, 3, 7, 8, 9, 12 and 16. Counts exceeded five per square centimeter on three of these days, the highest being August 29, when 26 grains were recorded.

These data indicate that the hayfever pollen density in the general air was excessive in this area on three days.

The air surrounding those areas in which Ragweed growths were classified as moderate and heavy would be more highly contaminated with Ragweed pollen, and these areas would contribute to the pollen density which was determined in the general air.

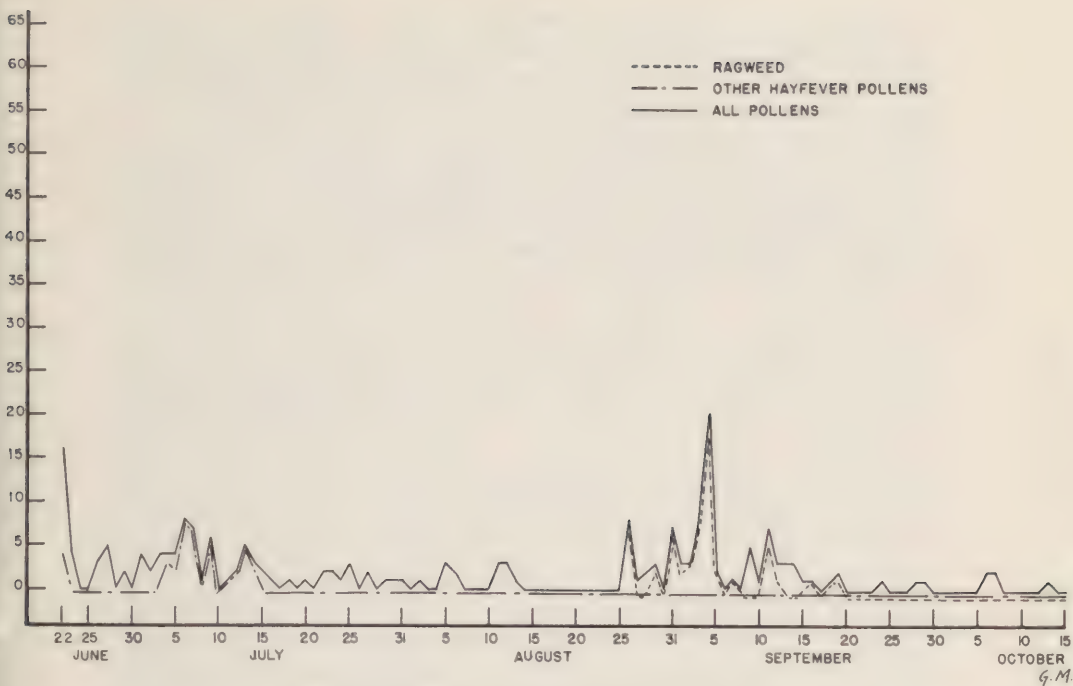
**STATION #10** was located in Keene, on top of one of the highest buildings, at an altitude of 480 feet. It was maintained by Mr. Evan White, City Health Officer.

Keene is situated at the northern edge of a large flat valley, immediately south of the foot hills of a low mountain range. The Ashuelot River runs through the City to the Connecticut Valley a short distance to the west. The territory surrounding Keene, excepting to the north and east, is heavily farmed. The northern and eastern regions are heavily forested, being predominantly White Pine and mixed hardwood.

The collecting device was located so that there was no interference to air movement, general exposure of the station being south-west.

Examination of the vegetation within a mile of the station for Ragweed plants revealed moderate to heavy concentrations. These grew on the edges of roads, in vacant lots and in the perimeter of peoples' gardens.

The following graph shows the occurrence and density of hayfever pollens at this station:



"Station #10—Daily Pollen Occurrence"

From the records and the graph the following facts can be educed:

Tree pollen occurred only one day June 22, when four grains of Birch were recorded.

Timothy first appeared July 4, and continued up to and including July 14, with the exception of the 10th. The count did not exceed eight grains per square centimeter of slide area on any day. This is the only time grass pollens were found on the slides.

Ragweed pollen occurred August 26, 29, and 31; and September 1 through 5, 7, 11, 12, 16, 18, and 19. The count exceeded six grains per square centimeter on three days during this period; August 26, and September 3, and 4. The highest number for any day was eight on September 4.

These data indicate that the Ragweed pollen density in the general air was excessive on three days. Persons exposed to the air in the vicinity of areas in which Ragweed growth was moderate to heavy would be subjected to higher concentrations of air borne pollen during the plant pollinating periods.

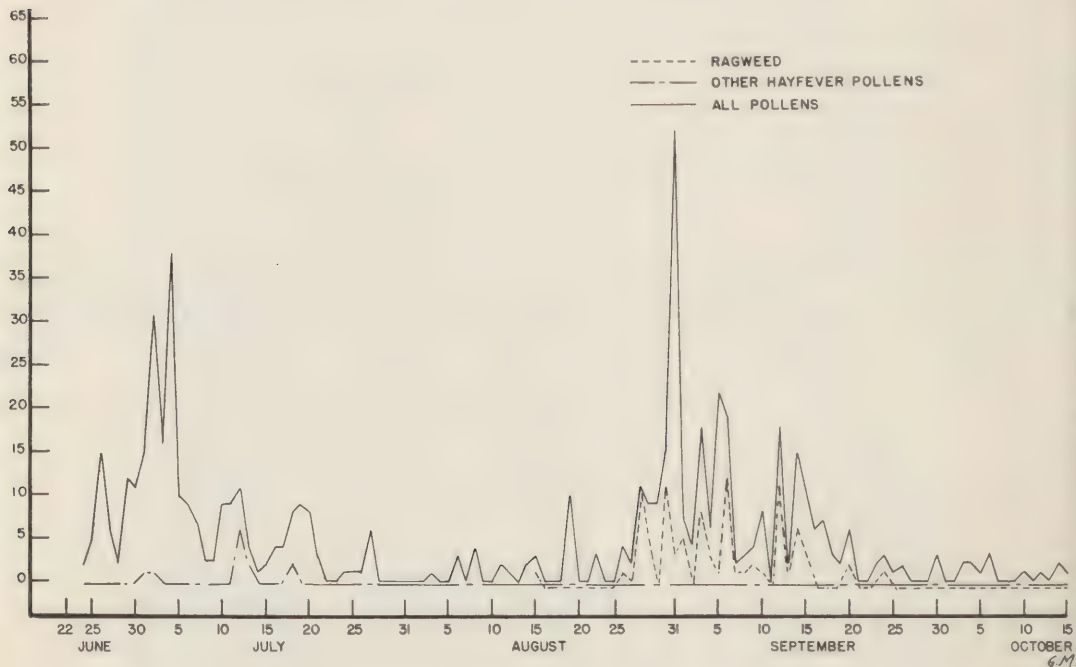
**STATION # 11** was located in Exeter at the home of one of the State Health Department employees, who maintained it throughout the survey. The only interference to the collecting device was a house about 150 feet away, and a large Elm tree 100 feet away.



Exeter is located in the Southeast corner of New Hampshire at an elevation of 30 feet, approximately ten miles from the ocean. The surrounding area is moderately cultivated, primarily for dairy and truck farming. Forest types are predominately White Pine with an admixture of hardwoods.

Examination of the area surrounding the station indicated a Ragweed density ranging from moderate to heavy, some plants being within 100 yards of the station location.

The following graph indicates the density and occurrence of the various pollen being studied:



"Station #11—Daily Pollen Occurrence"

Examination of the records and graph for this location indicates the following facts:

The only tree pollen occurring at this station was one grain of Birch on July 2.

June Grass was recorded once during the course of the survey with one pollen grain per square centimeter of slide area July 1.

The pollen of Timothy was recorded as occurring on July 12, 13, and 18. On none of these days did the count exceed six grains per square centimeter of slide area.

Short Ragweed appeared August 15, 25, and 27 through 31; and September 1, 3 through 15, 20 and 24. The counts exceeded six per square centimeter on only five of the twenty-two days in which Ragweed was observed.

Ragweed pollen density of the general air was excessive on 5 days. The pollen density in the air in the vicinity of areas in which Ragweed growths were moderate to heavy would be higher and probably present over a longer period of time.

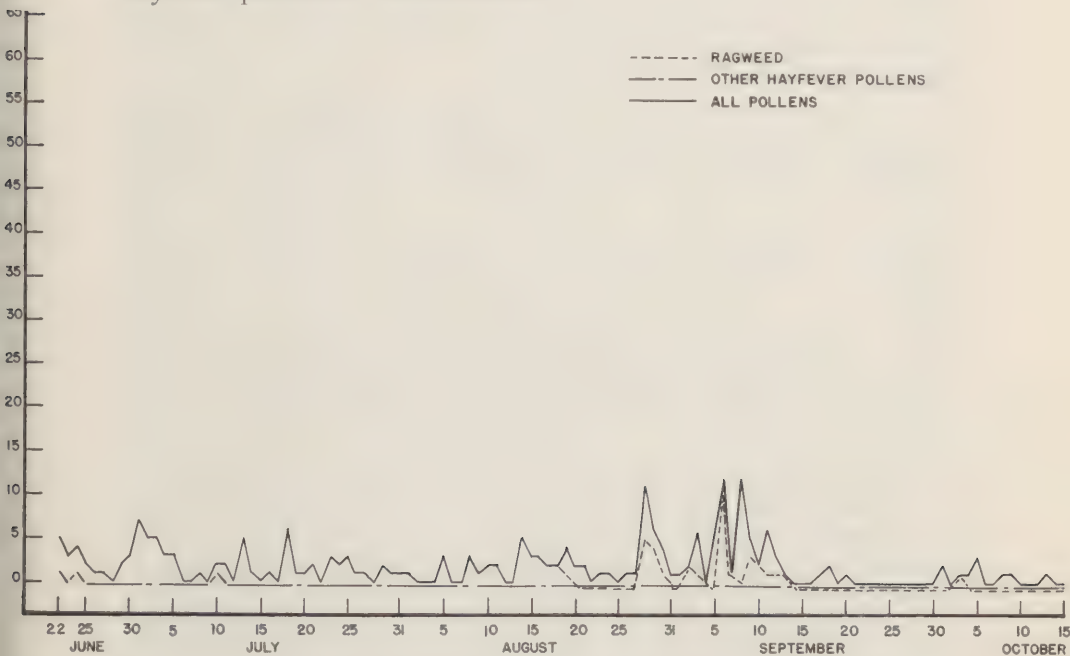
**STATION #12** was located in Nashua on the roof of the City Hall, at an altitude of 200 feet. This station was maintained by the staff of the local health officer. The building is one of the highest in the City, the only interference to air movement being a clock tower about 150 feet southwest of the collecting device. There were no other obstructions to interfere with operation of the device.

Nashua is in south-central New Hampshire, about five miles north of the Massachusetts border. The City is located in a wide, shallow valley which has been eroded by the Merrimack River. There are no hills in any direction near enough to cause wind changes.

The surrounding territory is moderately agricultural, primarily dairy and truck farms. The timber types immediately adjacent to the City are predominately scrub Oak, interspersed with some Poplar and White Pine.

A survey within a one mile radius of the station location for Ragweed plants indicated a moderate to heavy growth. These plants occurred along the edges of the city streets, vacant lots, gardens, and in waste areas throughout the City.

The following graph indicates the density and occurrence of hayfever pollens in this location:



"Station #12—Daily Pollen Occurrence"

G.M.

From the records and graph of this station the following information can be educed:

The only tree pollen found at this station was Birch, which occurred June 22, and 24. On each of these days there was one grain of pollen per square centimeter of slide area recorded.

The grasses are represented at this location July 10 when one grain of June Grass pollen was recorded. This is the only time in which the pollens of grasses causing summer hayfever were found.

Short Ragweed pollen was observed the following dates: August 18, 19, 23, 24, 28, 29, and 30; and September 2, 3, 6, 7, and 9 through 13 inclusive. The greatest number of grains appeared September 6, when eleven grains were recorded per square centimeter of slide area. There were no other days when this figure was approached by half. From these data it appears that the pollen density of the general air was excessive for one day. In the vicinity of those areas where Ragweed growths were moderate and heavy, the amount of pollen in the air would be substantially increased.

### **Summary of Results of Sampling Stations:**

A comparison of the graphs from all stations indicates a peak in airborne pollen which is on the decline at the time slides were first exposed. These pollens were in all cases from those of the various trees, the principle species represented being Birch. Due to the fact that the slides were exposed at the end of the flowering season for trees, conclusions in regard to these genera are not significant. Plans for the 1948 survey are such that the complete tree pollinating season will be covered.

The only stations at which the pollens of trees occurred to such an extent that they would be a factor in hayfever were #2 and #5. These amounts appeared on the slides only for the first three days of the survey, occurring in negligible amounts after that. There were a few grains of Oak, Beech and Poplar recorded. These last appeared at scattered locations in small numbers, and were not a factor in hayfever during the period of study.

Records were made of all pollens seen, both known and unknown. The graphs indicate the incidence of all pollens to be the highest during the tree flowering period. The pollens, other than those listed as being hayfever inducing, consisted primarily of Pine, Spruce, and Fir.

Tree pollens had generally disappeared by the 25th of June.

Grass pollens began to appear on the slides about the 1st of July, and had generally disappeared by the 15th of this month. The stations at which grass pollens appeared in sufficient density as to be a factor in hayfever were #1, #5, and #7.

At two of these stations, #5 and #7, there was a tremendous peak in Timothy occurrence in the period from the 5th to the 10th of July. This was such an outstanding departure from the normal



amount being counted, that an investigator spent some time checking the farmers in the surrounding areas. It was found at both stations that owners of adjacent land had harvested their hay crop at this time. Examination of the hay in the barn revealed that a high percentage was Timothy. It is believed that these haying operations caused an abnormal amount of pollen to be in the air at this time, which was detected on the exposed slides.

Records for the grass season indicate that there were varying densities of other grass pollens in the air. These pollens were recorded as being unknown, no attempt being made to identify them by species, due to the time necessary for identification.

The information available from the present survey indicates the summer hayfever situation in New Hampshire, at least in the localities studied, is not one to cause particular concern. The pollen does not seem to be airborne in sufficient numbers or density unless artificially disturbed by an operation such as haying.

The grass pollen season was generally over at all stations by the 15th of July.

From the 15th of July until the 15th of August there were no pollens in the atmosphere which are considered harmful to hayfever victims. This was true at all stations.

The first appearance of Ragweed was at station #11 on August 15. It appeared at other stations in the following order: Station 12, August 18; Station 6, August 19; Station 2, August 23; Stations 4 and 9, August 25; Stations 7 and 10, August 26; Station 3, August 30; Station 1, September 4; Station 5, September 11. Station 8 recorded no Ragweed pollen at any time during the entire season.

There were only five stations at which Ragweed occurred in sufficient quantities in the general air to be a factor in hayfever, according to density concentrations suggested by the American Academy of Allergy. These stations, with the number of days exceeding the limits are: Station 2, four days; Station 9, three days; Station 10, three days; Station 11, five days; and Station 12 one day.

A Ragweed survey of the area within one mile of Station #2 at Berlin revealed a relatively large number of plants. A large pulp mill there has miles of railroad track, and acres of ground on which pulpwood is usually piled, which were heavily infested with Ragweed. In addition, vacant lots, sides of streets and the grounds around residences showed growths of Ragweed plants in varying density. The plants were not present in the forest land north of the City, and were present in light to heavy densities south of the City. The counts at this station were affected by this dense growth of Ragweed in the city and on the pulp mill grounds.

The upper two-thirds of New Hampshire, that is from Station #7 (Laconia) north, except the City of Berlin, was relatively free of airborne Ragweed pollen. Results from these stations indicate that, even in areas where Ragweed did occur on the slides, it occurred in the general air in such small amounts and on so few days, that its effect on hayfever sufferers should be of short duration,

excepting in a few restricted local areas. This would not, of course, be true for individuals living in the vicinity of places where Ragweed growth was moderate or heavy.

Ragweed pollen, excepting at Stations 9, 10 and 11, had completely disappeared from the slides by September 15. It continued at these three stations for about 10 days longer, but in small amounts.

#### **Reconnaissance Surveys:**

Supplementing the actual pollen count from exposed slides, a reconnaissance survey of the entire State was made. The purpose of this reconnaissance survey was to determine the actual stand of Ragweed in the various areas of the State.



"Short Ragweed Along the New Hampshire Seacoast"

The following method of recording the density of growth was used:

Evaluation was based on observed growth along the highways, in vacant lots, cultivated fields, and various waste areas throughout the cities and towns. The density and extent of growth in listed areas was estimated, and classified into four categories, which are: negative, light, medium, and heavy. No attempt was made at actual measurement of the density of growth, results being based entirely upon visual estimates of three observers working independently.

The density growth categories were arbitrarily established according to maximum growth as found in New Hampshire, and will not, of course, parallel results of other studies in states where hayfever plant growth is more extensive.

No instances were found where areas of Ragweed exceeded more than one-tenth of an acre. The areas classified as heavy consisted essentially of a one to two foot width of Ragweed growth in the burn running continuously along the highways, and along town or city streets. Growths were also evaluated as found in cultivated areas, such as corn fields and bean patches, in vacant lots, near telephone poles, driveways, commercial buildings, filling stations and residences. Ragweed attained its heaviest growth in the center of the largest cities and towns. Many resorts and hotels in an otherwise Ragweed-free area had Ragweed growing immediately beside the buildings, and throughout the entire service area at the rear of the establishment. It was noted in many areas that Ragweed grew along the edges of main highways in strips averaging 1-2 feet in width. However when the sides of the highway were shaded by trees, or heavy growths of grasses, shrubs and ferns, no Ragweed was seen.

Following is a list of the Townships in New Hampshire, by Counties, according to the observed Ragweed growth:

(Note: Density growth classification was arbitrarily established according to maximum growth as found in New Hampshire.)

Following is a list of the Townships in New Hampshire, by Counties, according to the observed Ragweed growth:

Name	Negative	Light	Medium	Heavy
Belknap County				
Alton		X		
Barnstead			X	
Belmont				X
Center Harbor				X
Gilford				X
Gilmanton				X
Laconia				X
Meredith				X
New Hampton				X
Sanbornton				X
Tilton				X
Carroll County				
Albany		X		
Bartlett		X		
Chatham		X		
Conway		X		
Eaton		X		
Effingham		X		
Hale's Location		X		
Hart's Location		X		
Jackson		X		
Madison	X			
Moultonborough				X
Ossipee				X



Name	Negative	Light	Medium	Heavy
Sandwich		X		
Tamworth		X		
Tuftonboro		X		
Wakefield		X		
Wolfeboro			X	
Cheshire County				
Alstead		X		
Chesterfield			X	
Dublin		X		
Fitzwilliam		X		
Gilsum			X	
Harrisville				X
Hinsdale				X
Jaffrey		X		
Keene				X
Marlborough				X
Marlow		X		
Nelson		X		
Richmond				X
Rindge		X		
Roxbury				X
Stoddard		X		
Sullivan		X		
Surry			X	
Swanzey				X
Troy		X		
Walpole				X
Westmoreland				X
Winchester				X
Coos County				
Atkinson and Gilmanton				
Academy Grant	X			
Bean's Purchase	X			
Berlin				X
Cambridge	X			
Carroll	X			
Chandler's Purchase	X			
Clarksville	X			
Colebrook		X		
Columbia		X		
Crawford's Purchase	X			
Dalton				X
Dartmouth College Grant	X			
Dix's Grant	X			
Dixville		X		
Dummer		X		
Errol		X		
Erving's Location		X		

Name	Negative	Light	Medium	Heavy
Gorham				X
Green's Grant		X		
Jefferson		X		
Kilkenny		X		
Lancaster				X
Martin's Location	X			
Milan			X	
Millsfield		X		
Northumberland		X		
Odell		X		
Pinkham's Grant	X			
Pittsburg	X			
Randolph		X		
Sargents Purchase	X			
Shelburne				X
Stark		X		
Stewartstown		X		
Stratford				X
Success	X			
Thompson and Meserve's Purchase	X			
Wentworth's Location	X			
Whitefield		X		
Grafton County				
Alexandria		X		
Ashland				X
Bath		X		
Benton			X	
Bethlehem	X			
Bridgewater		X		
Bristol			X	
Campton	X			
Canaan				X
Dorchester			X	
Easton		X		
Ellsworth	X			
Enfield			X	
Franconia		X		
Grafton				X
Groton		X		
Hanover				X
Haverhill			X	
Hebron		X		
Holderness		X		
Landaff		X		
Lebanon			X	
Lincoln		X		
Lisbon		X		

Name	Negative	Light	Medium	Heavy
Littleton		X		
Livermore	X			
Lyman		X		
Lyme				X
Monroe		X		
Orange	X			
Orford		X		
Piermont		X		
Plymouth			X	
Rumney			X	
Thornton			X	
Warren		X		
Waterville	X			
Wentworth	X			
Woodstock		X		
Hillsborough County				
Amherst				X
Antrim				X
Bedford				X
Bennington				X
Brookline				X
Deering				X
Francestown				X
Goffstown				X
Greenfield		X		
Greenville		X		
Hancock				X
Hillsborough				X
Hollis				X
Hudson				X
Litchfield		X		
Lyndeborough				X
Manchester				X
Mason			X	
Merrimack				X
Milford				X
Mt. Vernon				X
Nashua				X
New Boston				X
New Ipswich				X
Kingston				X
Londonderry				X
New Castle				X
Newfields				X
Newington				X
Newmarket				X
Newton			X	
North Hampton				X



Name	Negative	Light	Medium	Heavy
Northwood				X
Nottingham				X
Plaistow			X	
Portsmouth				X
Raymond				X
Rye				X
Salem				X
Sandown				X
Seabrook				X
South Hampton				X
Stratham				X
Windham			X	
Strafford County				
Barrington				X
Dover				X
Durham				X
Farmington				X
Lee			X	
Madbury				X
Middleton				X
Milton				X
New Durham			X	
Rochester				X
Rollinsford				X
Somersworth				X
Strafford				X
Sullivan County				
Acworth		X		
Charlestown				X
Claremont				X
Cornish			X	
Croydon		X		
Goshen		X		
Grantham		X		
Langdon		X		
Lempster		X		
Newport				X
Plainfield				X
Springfield		X		
Sunapee		X		
Unity		X		
Washington		X		
Pelham			X	
Peterborough				X
Sharon				X
Temple			X	
Weare				X
Wilton				X



Name	Negative	Light	Medium	Heavy
Windsor			X	
Merrimack County				
Allenstown				X
Andover				X
Boscawen				X
Bow				X
Bradford				X
Canterbury			X	
Chichester				X
Concord				X
Danbury				X
Dunbarton			X	
Epsom				X
Franklin			X	
Henniker				X
Hill			X	
Hooksett				X
Hopkinton		X		
Loudon				X
Newbury		X		
New London		X		
Northfield				X
Pembroke				X
Pittsfield				X
Salisbury				X
Sutton			X	
Warner			X	
Webster		X		
Wilmot		X		
Rockingham County				
Atkinson				X
Auburn				X
Brentwood				X
Candia				X
Chester				X
Danville			X	
Deerfield		X		
Derry				X
East Kingston			X	
Epping				X
Exeter				X
Fremont				X
Greenland				X
Hampstead				X
Hampton				X
Hampton Falls				X
Kensington			X	

Attention is invited to photographs 4, 5, and 6 illustrating areas which were classified by the observers as being heavily infested with a growth of Short Ragweed.

#### **Area Surrounding the State:**

The hayfever incidence in New Hampshire is effected by the area surrounding the State to some extent, particularly in those regions immediately adjacent to the border. These surrounding areas effect the situation as follows:

The north end of the State, and about twenty-five miles of the north-western part, borders on Canada. The land in Canada beyond the Boundary Mountains is largely plains and heavily cultivated. The area to the west is primarily forest land. Ragweed and grasses which may occur in these cultivated areas will have little or no effect on the populated sections of New Hampshire, due to large tracts of privately owned timber land which act as a barrier. The forested portion of Canada would have a very negligible effect as Spruce and Fir are the predominating timber types.

The western neighbor is Vermont, whose boundary runs common with New Hampshire along the Connecticut River, for more than nine-tenths of the entire western length of the State. The northern quarter of Vermont, adjacent to New Hampshire is largely timber land. This timber type is once again the predominating northland Spruce-Fir, with an admixture of hardwood, primarily Beech and Birch. Birch pollen may have some effect on the hayfever incidence in the northern reaches of the State.

The lower three-quarters of Vermont is heavily farmed. These farms are in the rich river bottoms of the Connecticut River Valley, and are mostly given over to dairying. Hay crops are raised for cattle feed, and some of these plants are those which cause hayfever. There is also Ragweed, which varies in density from light to extremely heavy.

The prevailing winds in New Hampshire are from the north-west throughout all months of the year. Therefore, any hayfever plant pollens which are produced in Vermont, particularly in the Connecticut Valley Region, will probably find their way into New Hampshire. This is particularly important as the Valley on the New Hampshire side is as heavily populated as on the Vermont side, and it is possible for the Vermont allergens to have some effect on the people in these areas.

Massachusetts borders New Hampshire on the south, but would have little effect on the hayfever situation in the State, due to the prevailing winds being from the northwest. The adjacent central and western parts of Massachusetts are made up of small farms and farm woodlots. Timber types in the farm woodlots occur in about the same proportion as they do in the southern part of New Hampshire. The eastern part of Massachusetts is heavily industrialized, and the cities are surrounded by truck gardening farms. Excepting for areas very close to the New Hampshire border, at





"Short Ragweed Growth in the City of Concord"

times when the winds were blowing from the south or southeast, hayfever pollens as they occur in Massachusetts would have little effect on the problem in New Hampshire.

Maine borders New Hampshire on the east entirely, excepting for an eighteen mile stretch of New Hampshire coast line, and a small area of the industrialized section of Massachusetts. The Maine country is heavily timbered for nearly its entire length. Timber types vary from Spruce-Fir in the north, to White Pine in the south. These two softwood timber types are interspersed with hardwoods consisting primarily of Birch, Beech, and Maple; with Oak appearing at the south. Due to the direction of the prevailing wind in New Hampshire, and the vegetational types along the border, the hayfever incidence should be little effected by pollens as they may occur in the State of Maine.

Generally speaking, the only area adjacent to New Hampshire which would have an appreciable effect upon its hayfever problem, is that land which lays along the Connecticut Valley in the State of Vermont.

### **Control Measures**

The data from these studies indicate that the pollen of Ragweed is the primary cause of seasonal hayfever in New Hampshire. There are various methods of Ragweed control which may be used. These control methods include the following:

#### **(1) Pulling**

The simplest and least expensive method of control is pulling up the plants as they appear. This method is slow, and can be applied only to relatively small areas, where the density of growth is high. This method could be used primarily around residences, vacant lots, small resorts, and in the center of cities and towns, where the surrounding area was relatively free of Ragweed.

#### **(2) Cutting**

Another method of control is by the use of various cutting instruments such as scythes and mowing machines. This can be used in somewhat larger areas, particularly by farmers and local groups who are interested. In order to carry out this system successfully, several cuttings a year have to be made. The cutter bar on a standard mowing machine can be raised to cut off the tops of the plants early in the season. This can be done in rough pasture lands, large city lots, and along the right-of-way of various town and city streets. The character of Ragweed is such, however, that if the top is not cut off immediately prior to the beginning of the flowering season the plant will continue to develop flower heads, pollinate, and pollen will be released into the air. Examples of this were noted along some of the highways, where the plant had been cut back during the course of the State Highway Department's regular weed control program. The plants flowered and pollinated when only three to six inches in height, which is particularly striking when the normal height of this plant is two to three feet.

### (3) Herbicides

The most efficient and inexpensive control method for use on large areas are herbicides. These may be placed in three major groups:

A. Soil sterilants—These chemicals make the soil toxic to plants. They are used either in sprays or in dry form. Sodium chlorate, sodium arsenate, and borax are the principal compounds in this class. Soil sterilants are chiefly used for fire lanes, parking lots, railroad right-of-ways, and other places where vegetation is not wanted.

B. Non-selective contact herbicides—These chemicals destroy top growth of plants when they are wetted with the spray. They do not kill roots or perennials. Contact herbicides are used in places where mowing is impractical, or where vegetation should be kept in check, such as ditch banks, fence rows and the edges of lawns.

C. Selective herbicides—These are chemicals which may be sprayed on an area to destroy the unwanted growth, while not affecting that growth which is desirable.



"New Hampshire State Highway Department Spraying  
2, 4-D for the Control of Ragweed"

There are three sub-groups of these selective herbicides: a. Those selective because they do not wet the crop; b. oil sprays that kill most plants; and c. the growth regulator or hormone type. The only one of these three groups which is practical for Ragweed control is the so called 2, 4-Dichlorophenoxyacetic Acid, (commonly known as 2, 4-D.) The effect of 2, 4-D is physiological in that the chemical, or its effect, travels through the plant system to induce a telemorphic response which contributes to the death of



the plant. The action is not rapid and death comes on gradually but surely.

The remarkable thing about 2, 4-D is that it affects most broad-leaved plants but usually not the grasses. It may be used as a selective spray for turf to kill Ragweed, Dandelions, Plaintain and many other weeds. Care should be used in handing this 2, 4-D so that the chemical will not land on some of the more desirable broad-leaved plants, such as the various horticultural species used in landscaping. This chemical is non-toxic to man or animals.

2, 4-D is produced by a number of manufacturers, and may be purchased in local stores. It is usually applied in a spray, using the proper concentration found on the container as given by the manufacturer of the product.

### **Control Programs**

The New Hampshire State Highway Department, during the summer of 1947, conducted a program of Ragweed control along certain highways. This spraying was done principally around the Town of Lancaster, using a tank truck and 2, 4-D solution.

Several communities have inaugurated control programs sponsored by social organizations. These for the most part consisted of pulling Ragweed along the principal streets, in vacant lots and around residential homes.

Control of Ragweed within the limits of various communities can be obtained through such programs of pulling or spraying. This activity should be supplemented in the less congested areas by local highway department equipment, with facilities for spraying 2, 4-D solution. Such programs are of particular interest to resort areas.

It should be noted however, that the seeds of the Ragweed plant remain viable in the soil for a period of forty to fifty years. Control by hand methods necessarily disturbs the soil, thereby creating a place in which the plants will reoccur. These control methods must be continued over a period of years to reduce Ragweed growth to an effective point.

### **Questionnaire on Hayfever Experience**

A questionnaire was included in one issue of the Department's monthly publication, "Health News," requesting the recipients, if they were hayfever victims, to fill out the attached form and return it to the State Health Department. This questionnaire included spaces for the name and address of the individual, the date on which their symptoms of hayfever began for the current year, the period of years in which they had had the symptoms of hayfever, and whether or not they had been treated for this disease. The circulation of this publication includes approximately 9,500 residents.

Answers to this questionnaire were received from eighty persons. While it is realized that data obtained through question-

naires of this type is subject to many criticisms, an analysis of the data received showed the occurrence of hayfever among those individuals who returned the questionnaires as follows: Spring Hayfever 2.5%; Summer Hayfever 12.5%; and Fall Hayfever 82.5%; the percentage affected in all three seasons was 2.5%.

The largest percentage of the group is affected during the fall, or Ragweed, season. Eighty-two and one half percent of the affected people reported their symptoms occurring at this time. This is particularly striking due to the fact that Ragweed is listed by individuals in case after case as being the plant responsible for this disease.

The data from this group showed the geographical distribution of cases according to zones as follows:

<i>Zone</i>	<i>Spring</i>	<i>Summer</i>	<i>Fall</i>	<i>All-Seasons</i>	<i>Total</i>
1	0	1	4	0	5
2	1	4	12	0	17
3	1	5	50	2	58
Total	2	10	66	2	80

The incidence of Hayfever in New Hampshire can not be determined or estimated from the data received from this questionnaire.

### Summary

The results of this preliminary study suggest that Ragweed hayfever in New Hampshire, when compared with other more intensively cultivated areas in the northeast is not serious, and readily lends itself to nearly complete control. This conclusion is supported by the following facts:

(1) A large percentage of the land area of the State is at such an altitude that Ragweed will not grow.

(2) Approximately 81% of the total acreage of the State is forest, in which Ragweed does not grow.

(3) The various States and Provinces surrounding New Hampshire, with the exception of a small part of Vermont, have little or no effect on the airborne pollen density in this State.

(4) Data on airborne pollen concentrations was obtained throughout the State, at twelve stations located fifty air miles apart. These data indicate that the airborne pollen concentration was not, in general, occurring in quantities sufficient to cause hayfever symptoms, except for five locations, and at these for only short periods of time.

(5) A reconnaissance survey of the State made to evaluate Ragweed growths showed that, in most areas, growths were not of sufficient magnitude but that they could be controlled readily. Many localities were found to be practically free, or to have very light growths in restricted areas. In other areas the growth was found to be more extensive, but no Ragweed growths were found which exceeded one-tenth of an acre. It is estimated that Ragweed has a probable habitat of less than 2% of the State's area.

In respect to hayfever caused by pollens of trees, the data obtained in this study is insufficient to make any evaluation of the

problem. It is expected that such data will be obtained in future studies.

Hayfever caused from the pollens of grasses may be placed in a similar growth category with Ragweed hayfever. Factors such as the large forest acreage have a similar importance in reducing the incidence to grass hayfever as to Ragweed hayfever. Haying operations will temporarily affect the pollen concentrations in air as described in this report.

Ragweed pollen concentrations in the air at the twelve sampling stations were very low, except at five stations for short periods of time. In general, the pollen density was greater in the southern part of the State. These data suggest that the exposure of individuals to hayfever pollen is a local problem, namely that of individual communities, and the hayfever patient's own immediate environment. In other words, the hayfever pollen concentrations are not sufficient to be transported into other communities by air movement, or wind, in sufficient quantities to be detrimental to hayfever victims. In addition, the general air in the communities studied was only slightly contaminated with pollens except as noted above.

Reconnaissance surveys showed that the growth of Ragweed was high in areas of dense population and the growth decreased as the population decreased. Ragweed appears to be a civilized plant, occurring mostly in the waste areas surrounding human habitations, and is unable to compete with the hardier plants in the wild. This fact is well demonstrated by this study where it was found that the forested and mountainous two-thirds of the State is comparatively free of Ragweed. Heavily forested land, altitude, soil types and human concentrations all affect Ragweed growth.

Returns from the hayfever questionnaire show that a few of the allergic individuals live in the same general locality where little or no pollen appeared on the sampling slides. Investigation revealed that these patients were living in dwellings where the yard, back of the garage, or surrounding waste area had small local growths of Ragweed. Many of these persons worked around their yards in close proximity to the Ragweed, and brushed repeatedly against pollinating plants. Slight movements of the flowering plant will release thousands of pollen grains into the air in the immediate breathing zone of the individual.

It should be noted that the collecting devices were operated in an attempt to evaluate the average pollen density being carried some distance by air currents, and will not measure specific local air concentrations.

During the course of the survey investigators found many individuals who said they knew Ragweed on sight. Few recognized the plant when it was actually shown to them. Pigweed (*Amaranthus*) was commonly confused with Ragweed, and vice versa. Individuals ordinarily well-informed called practically any

plant "Ragweed" which had some of the same growing habits and characteristics. Before any control program could be inaugurated, it would be necessary to inform the public as to what Ragweed is, where it grows, and what can be done to control it. Many resort hotels, cabins, and tourist homes in our large generally pollen free areas could afford their guests complete freedom from Ragweed pollen with a little Ragweed control in their own backyard.

This report covers the period from June 22 to October 15, 1947. Additional study will be made in order to get samples covering several years weather variations. Growing seasons differ from year to year, and the findings of one summer would not necessarily be applicable to the average season. A study covering five consecutive years should reveal facts which can be applied generally throughout various weather conditions. The findings of this report cannot be considered conclusive but will be revised by the data from future years. Comparisons of the 1947 weather, with the average figures covering a period of more than 75 years, indicates that a departure from normal tended to produce conditions which would aid in the development of the various pollens.

Studies are to be continued at 26 locations in the State, rather than at 12. This will provide a better coverage pattern, and enable this Division to better interpret the situation as it occurs. Reports of each years findings will be made at the time they are compiled and interpreted. At the completion of the entire course of the study, a final report will be made in an attempt to correlate the factors of the various seasons.



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